Energy Research and Development Division
FINAL PROJECT REPORT

California Geothermal Energy Collaborative

Geothermal Education and Outreach Guide

Task #4.4

Prepared for: California Energy Commission

Prepared by: RMT, Inc.

RMT
ENVIRONMENT • ENERGY • ENGINEERING

NOVEMBER 2011
CEC-500-2013-105

PRIMARY AUTHOR(S):
Tania Treis
Laurie McClenahan Hietter

RMT, Inc.
4 West Fourth Ave, Suite 303
San Mateo, CA 94402
650-373-1200
www.rmtinc.com
Subcontract Number: 09-001429-02
The Regents of the University of California

Contract Number: 500-08-017

Prepared for:

California Energy Commission

Prab Sethi
Contract Manager

Linda Spiegel
Office Manager
Energy Generation Research Office

Laurie ten Hope
Deputy Director
ENERGY RESEARCH AND DEVELOPMENT DIVISION

Robert P. Oglesby
Executive Director

ACKNOWLEDGEMENTS

The authors would like to acknowledge the assistance and support of the California Energy Commission, the Public Interest Energy Research Program, University of California Davis, and the California Geothermal Energy Collaborative. We specifically would like to thank Judy Fischette and Bill Glassley for their assistance with this document and for their unwavering support of the California Geothermal Energy Collaborative. We also thank Charlene Wardlow of Ormat for her persistence in making this Guide a reality and her many years of support and service to the geothermal industry.

The authors also thank the Navy Geothermal Program Office, Magma Energy, Alta Rock, Davenport Newberry, and Calpine for the information they have made public. We also thank Jessie Brown and the Iowa Department of Natural Resources for their permission to use and adapt their Watershed Program Public Outreach Plan Guide in Appendix B.

PREFACE

The California Energy Commission Energy Research and Development Division supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

The Energy Research and Development Division conducts public interest research, development, and demonstration (RD&D) projects to benefit California.

The Energy Research and Development Division strives to conduct the most promising public interest energy research by partnering with RD&D entities, including individuals, businesses, utilities, and public or private research institutions.

Energy Research and Development Division funding efforts are focused on the following RD&D program areas:

- Buildings End-Use Energy Efficiency
- Energy Innovations Small Grants
- Energy-Related Environmental Research
- Energy Systems Integration
- Environmentally Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Transportation

The *Geothermal Education and Outreach Guide* is the interim Guide for the Regents of the University of California, Davis, on behalf of the California Geothermal Energy Collaborative, conducted by RMT, Inc. The information from this project contributes to Energy Research and Development Division's Geothermal Program Area.

For more information about the Energy Research and Development Division, please visit the Energy Commission's website at www.energy.ca.gov/research/ or contact the Energy Commission at 916-327-1551.

ABSTRACT

This report provided a reference tool for geothermal stakeholders interested in developing direct use or power production projects. It outlined a recommended approach to public outreach through all phases of geothermal development. It provided advice on how to determine the outreach audience, how to approach outreach, tools available for outreach, and how to prepare an outreach plan. Successful implementation of these elements at various geothermal development sites were highlighted and referenced throughout the report. The report also provided numerous education tools and references for geothermal development.

Keywords: Geothermal, public outreach, permitting, environmental, mitigation, renewable energy, renewable energy development.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Introduction

Public outreach programs help stakeholders involved understand the elements that are important for a good project outcome. Geothermal development is complex, time and cost intensive, and involves a process that cannot be easily seen, like solar and wind development. While many people may understand extracting energy from the sun and wind, extracting heat and energy by drilling wells deep underground is less obvious.

The location of geothermal resources adds to the complexity of community concerns surrounding them. The best resources are often located in undeveloped rural areas within or near small communities. These resources are inherently associated with seismic regions and unique hot springs that often have extensive cultural significance. Outreach can be used to educate the audience on the science behind geothermal development as well as the ways in which a plant can be designed to minimize effects on the community and the environment.

Project Purpose

This report was intended to assist California geothermal stakeholders in planning for, implementing, and participating in the public outreach process. It addressed public outreach principles for both high and low temperature geothermal resource development.

Public outreach is necessary for any project that involves discretionary decision-making by any public regulatory entity. The level of controversy and stakeholder concern can vary substantially depending upon the location of the project and the surrounding environment and community. The outreach approach should be adapted to the circumstances surrounding a project, which are determined through early and frequent consultation with interested parties.

Acknowledging and addressing public concerns through community education and outreach can build trust and support. Conducting outreach beyond the minimum requirements of local, state, or federal laws or agency processes can often save time and money over the duration of the project and for future projects and expansions.

Project Results

This report provided a large list of strategies to choose from to tailor an appropriate public outreach plan. The key components of outreach addressed in this report included:

- Identifying the stakeholders and interested parties.
- Defining and understanding the concerns of the outreach audiences.
- Defining outreach strategies for each type of stakeholder and interested party.
- Preparing outreach materials tailored to the various audiences.
- Selecting the tools to disseminate outreach materials.
- Communicating the public participation schedule.
- Addressing key concerns regarding geothermal development.

This report can also be used as an educational tool for addressing the key concerns and appropriate mitigating actions associated with geothermal development. Numerous tips and references for educating various parties involved in outreach were provided.

Project Benefits

Public outreach is an important part of developing geothermal resources and is a necessary part of every project. Geothermal power will ultimately serve the members of the communities around it and creating a project in collaboration with the community and regulators will facilitate the permitting process. The long-term benefits of public outreach include building consensus and support around a project, allowing for a faster and less expensive permitting process, and creating a community and environmentally friendly project.

CHAPTER 1: Introduction

1.1 Guide Overview

The public has unprecedented access to information in the twenty-first century. The number of ways of disseminating information has grown exponentially, allowing immediate transfer of information via web-based tools such as email, websites, Facebook, Twitter, LinkedIn and others. This Guide has been designed to assist developers and agency staff, as well as the public, to understand issues associated with geothermal development, how to communicate with stakeholders to gather input in order to make informed decisions.

This Guide addresses methods to successfully plan for and perform or participate in public outreach on geothermal projects and to educate the intended audiences on geothermal development. The level of controversy and stakeholder concern can vary substantially depending upon the location of the project and the surrounding environment and community. The outreach approach should be adapted to the circumstances surrounding a project, which are determined through early and frequent consultation with interested parties. This Guide provides a list of strategies to choose from in order to tailor an appropriate public outreach plan.

This Geothermal Education and Outreach Guide has been prepared for the California Geothermal Energy Collaborative (CGEC) as a resource for California stakeholders. The Guide focuses on California geothermal resources; however, the general information presented is applicable to geothermal outreach efforts in any location. For the purposes of this Guide, a geothermal project refers to commercial-scale production of a high or low temperature geothermal resource[1] for generation of saleable power. A geothermal project could also encompass a direct-use system. In this Guide, a direct use system refers to the use of a low temperature geothermal resource for thermal applications, such as space heating, aquaculture, greenhouses, food drying, etc. This Guide does not address geothermal heat pump applications.

[1] Federal: Geothermal Steam Act of 1970 (Public Law 91-581, 84 Stat.1566, 30 U.S.C. 1001-1025)
Geothermal steam and associated geothermal resources means (i) all products of geothermal processes, embracing indigenous steam, hot water and hot brines;(ii) steam and other gases, hot water and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations; (iii) heat or other associated energy found in geothermal formations; and (iv) any byproducts derived from them;

California: Public Resources Code Section 6903
Geothermal resources shall mean the natural heat of the earth, the energy, in whatever form, below the surface of the earth present in, resulting from, or created by, or which may be extracted from, such natural heat, and all minerals in solution or other products obtained from naturally heated fluids, brines, associated gases, and steam, in whatever form, found below the surface of the earth, but excluding oil, hydrocarbon gas or other hydrocarbon substances.

1.2 History of Geothermal Development in California

1.2.1 Geothermal Potential and Development

Geothermal energy is produced by the heat of the earth and is often associated with volcanic and seismically active regions. California, with its location on the Pacific "Ring of Fire," has 25 known geothermal resource areas, 14 of which have temperatures of 300°F (148°C) or greater. Many areas of geothermal potential were designated by the United States Geological Survey as Known Geothermal Resource Areas (KGRAs). Existing geothermal fields and operating power plants are shown in Figure 1.

California is the home of the first commercial geothermal power development in the United States, with the development of Pacific Gas and Electric's 11 megawatt (MW) power plant at The Geysers KGRA in 1960 (McLarty et al. 1992). It is one of only two current producing locations in the world where a high-temperature, dry steam resource is found that can be directly used to turn turbines and generate electricity (the other being Larderello, Italy).

California currently has 2,565.5 MW of installed capacity generated by 48 power plants (Geothermal Energy Alliance 2010) located in:

- Sonoma and Lake Counties' The Geysers (a photo of a Geysers' power plant's Unit #18 is shown to the right).
- Imperial County—Multiple KGRAs
- Inyo County—Coso KGRA
- Mono County—Mono-Long Valley KGRA

Photo Credit: California Energy Commission

It is estimated that the state has a potential of more than 4,000 megawatts of additional power from geothermal energy, using current technologies (GEA 2010).

Additional areas have undergone exploration and environmental review for potential development, such as the Glass Mountain KGRA area in northern California, but are yet to be developed with operating facilities.

Forty-six of California's fifty-eight counties have lower temperature resources that could be utilized for direct-use geothermal projects. Direct-use of geothermal energy is the process in which hot water is pumped from a hot water well and run through tubing of some sort to heat a space or material. In fact, the City of San Bernardino developed the largest geothermal direct-use project in North America, heating 37 buildings -- including a 15-story high-rise and government facilities -- with fluids distributed through 15 miles of pipelines.

When added together, California's geothermal power plants produce about 4.5 percent of the California's total electricity (CEC 2011), and could produce much more.

1.2.2 Public Outreach for Geothermal Projects in California

Most geothermal development in California has involved an outreach component, as most developments have required approvals and permits from government entities. Regulatory involvement often invokes a public review process. Public outreach has most often occurred in parallel with review under the California Environmental Quality Act of 1972 (CEQA) (Public Resources Code § 21000-21177; Guidelines-CCR Title14, Div.6, Chapter 3 §15000-15387) and/or the National Environmental Policy Act of 1969 (NEPA) (42 USC §4321; 40 CFR § 1500.1).

The environmental review process, however, can be protracted and can cause considerable project delays and increases in costs when contention arises between parties such as government agency staff, the community, stakeholders, and the developer. Public outreach, if performed properly, can be a tool to educate all parties at the earliest stage of project development to help minimize project planning costs and delays and to create an environmentally and community friendly project.

An analysis of comments and responses for geothermal development across the western US was undertaken by the National Geothermal Collaborative (NGC). The *Geothermal Outreach Principles and Comment Analysis*

(MHA Inc.) was published in 2005, which included a technical analysis of the comments received during public outreach associated with the environmental review process for eight proposed geothermal projects. Several outreach principles were developed in the Guide. This Guide is meant to provide instructions and recommendations for implementing those outreach principles.

1.3 What is Public Outreach?

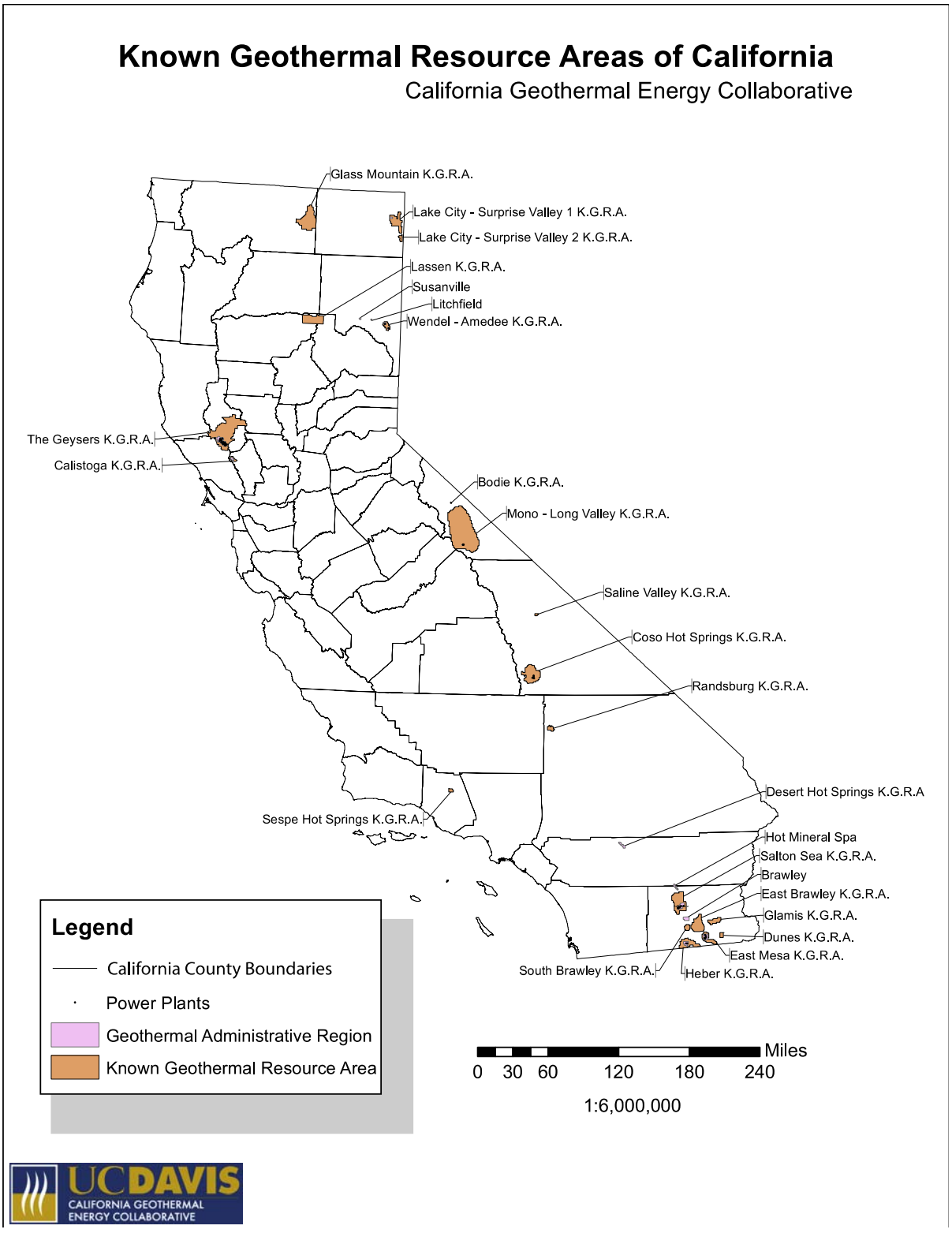
For the purposes of this Guide, public outreach refers to a process that informs and involves interested parties in a decision making process. Regulators, landowners, and other interested or potentially impacted parties are invited to participate in discussions of the benefits as well as the issues surrounding a proposed development and to provide input that may make for a more environmentally and community-friendly, yet economically viable, project. Public outreach is also a process that seeks to educate everyone involved on the science, the environment, and the community concerns surrounding the development.

1.4 Why is Public Outreach Important?

1.4.1 Meeting Legal Requirements

Public outreach is often initiated by the need to meet the legal requirements of CEQA and NEPA, the Clean Water Act (CWA), the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), or other regulations. CEQA and/or NEPA are triggered whenever a regulatory agency must make a discretionary decision on a proposed project. The intent of CEQA and to some extent NEPA is to provide disclosure to the public of a project's potential impacts on the environment prior to the agency making the decision to approve or deny the project and if approved, to implement measures to mitigate potential environmental impacts. The process involves preparation of a disclosure document, which may be an Initial Study and Mitigated Negative Declaration (IS/MND) or an Environmental Impact Guide (EIR) under

Figure 1: Known Geothermal Resource Areas and Associated Geothermal Plants



Layers obtained from: ftp://ftp.consrv.ca.gov/pub/oil/Data_Catalog/Geothermal/KGRA & ftp://ftp.consrv.ca.gov/pub/oil/Data_Catalog/Geothermal/Geothermal_fields

Table 1. Installed Geothermal Plants in California

PLANT	CAPACITY	OWNER	KGRA AREA
BLM East	45	Coso Operating Company	Coso
BLM West	45	Coso Operating Company	Coso
Navy 1	102.4	Coso Operating Company	Coso
Navy 2	100	Coso Operating Company	Coso
Gem 2	18.5	ORMAT	East Mesa
Gem 3	18.5	ORMAT	East Mesa
McCabe	11.5	ORMAT	East Mesa
ORMAT Geothermal 1	22.4	ORMAT	East Mesa
ORMAT Geothermal 1E	14.4	ORMAT	East Mesa
ORMAT Geothermal 1H	14.4	ORMAT	East Mesa
ORMAT Geothermal II	24	ORMAT	East Mesa
Heber HGC	62	Covanta Geothermal Operations	Heber
Heber SIGC	80	Covanta Geothermal Operations	Heber
Mammoth MP1	10	Mammoth Pacific	Mammoth Lakes
Mammoth MP2	15	Mammoth Pacific	Mammoth Lakes
Mammoth PLES1	15	Mammoth Pacific	Mammoth Lakes
Del Ranch	35.8	Cal Energy Operating Corporation	Salton Sea
JJ Elmore	35.8	Cal Energy Operating Corporation	Salton Sea
Leathers	35.8	Cal Energy Operating Corporation	Salton Sea
Salton Sea Unit 1	10	Cal Energy Operating Corporation	Salton Sea
Salton Sea Unit 2	21.8	Cal Energy Operating Corporation	Salton Sea
Salton Sea Unit 3	54	Cal Energy Operating Corporation	Salton Sea
Salton Sea Unit 4	51	Cal Energy Operating Corporation	Salton Sea
Salton Sea Unit 5	50	Cal Energy Operating Corporation	Salton Sea
Vulcan	39.7	Cal Energy Operating Corporation	Salton Sea
Aidlin	22.4	Calpine	The Geysers
Bear Canyon	22	Calpine	The Geysers

Big Geysers	95	Calpine	The Geysers
Bottle Rock	55	Bottle Rock Power Corp.	The Geysers
Calistoga	97	Calpine	The Geysers
Cobb Creek	110	Calpine	The Geysers
Eagle Rock	110	Calpine	The Geysers
Grant	120	Calpine	The Geysers
Lake View	120	Calpine	The Geysers
McCabe	110	Calpine	The Geysers
NCPA 1	110	Northern California Power Agency	The Geysers
NCPA 2	110	Northern California Power Agency	The Geysers
Quicksilver	120	Calpine	The Geysers
Ridgeline	110	Calpine	The Geysers
Socrates	120	Calpine	The Geysers
Sonoma	78	Calpine	The Geysers
Sulphur Springs	117.5	Calpine	The Geysers
West Ford Flat	28.8	Calpine	The Geysers
Amedee	2.6	Amedee Geothermal Venture 1	Wendel-Amedee
Wineagle	0.7	Carson Development Co. Inc.	Wendel-Amedee

Information obtained at: http://www.unr.edu/geothermal

CEQA and an Environmental Assessment and Finding of No Significant Impact (EA/FONSI) or Environmental Impact Statement (EIS) under NEPA.

While public outreach can be driven by legal requirements, outreach can go beyond meeting the minimum requirements. A good outreach program should be used to build consensus or informed consent for a project and to minimize the environmental impacts of the project.

For most projects, the key interested parties and their major environmental concerns are identifiable early in the development process. Conflicts and concerns are usually expressed during the associated public comment period in letters, phone calls, emails, or during meetings. These comments must be addressed by the lead agency (the agency responsible for conducting CEQA or NEPA) for the project in the documents that results from the studies. If there are unresolved issues with the development, legal challenges may occur if the outreach process was not followed properly or the development is in violation of another statute. Because of the possibility of legal challenges, agency staff may take longer to come to a decision if issues are not clear or resolved in the community, thereby delaying the project.

1.4.2 Consensus Building

Consensus-building stakeholder processes should be the product of a good-faith effort to address the interests of all stakeholders, while recognizing that it may not result in unanimity (Susskind and Cruikshank 2006). Participation in an outreach process can translate to a feeling of understanding, ownership, and pride. Allowing all stakeholders to have a voice in the process fosters greater support for a geothermal project within the community it serves.

Project expansion for existing geothermal plants may become an economically feasible option, which too may trigger environmental review for permitting and additional public outreach. A project proponent that communicates well and has a good track record with the public, stakeholders, and agencies is in a better position than a project proponent that never resolved perceived adverse issues or conflicts with the surrounding community on the initial project. Developing a strong relationship with the community is important for the long-term success of current and future projects and benefits all stakeholders.

1.4.3 Defining Project Success

A strong, well researched, and thoughtfully designed project is the best tool for a successful outreach and permitting process. Many of the concerns of geothermal development are misconceptions that can be addressed through education of the intended audience. By highlighting appropriate studies and data on geothermal energy along with the associated environmental effects of its development and use, developers stand to build consensus early on.

Successful geothermal development requires an experienced team of implementers associated with every phase of development from initial siting and permitting, through drilling, engineering design, plant construction, and operation. Part of the outreach process should include demonstrating the project team's experience with the issues raised by the public and regulators. A team that can elaborate on concerns and provide solutions based on their experience will gain the most credibility. Bringing in the expertise early will also help to minimize issues that can arise later in the process.

An experienced team knows the elements that make a good project:

- Collecting complete baseline data to understand potential impacts so the project can be designed to try and avoid resource conflicts
- Having good geologic and geophysical data to support drilling locations to minimize the number of wells that may need to be drilled
- Understanding and addressing public concerns in project design
- Siting facilities away from sensitive habitats or cultural sites
- Minimizing off-road vehicle travel through appropriate design, and having a robust air quality monitoring and mitigation program with adaptive management techniques
- Being a good neighbor to the community

1.4.4 Demystifying Geothermal Development to Enhance Acceptance

Public outreach programs help everyone involved understand the elements that are important for a good project outcome. Geothermal development is complex, time and cost intensive, and

involves a process that cannot be easily seen, like solar and wind development. While many people may understand extracting energy from the sun and wind; extracting heat and energy by drilling wells deep underground is less obvious.

The location of geothermal resources adds to the complexity of community concerns surrounding them. The best resources are often located in undeveloped rural areas within or near small communities. These resources are inherently associated with seismic regions and unique hot springs that often have extensive cultural significance. Outreach can be used to educate the audience on the science behind geothermal development as well as the ways in which a plant can be designed to minimize effects on the community and the environment.

1.5 Preparing for Outreach

The following steps should be performed to prepare for outreach:

- **Define your project and identify uncertainties**. Define the technology desired, the anticipated size of the project (capacity and footprint), the project location, and transmission access. If not all of the details are known, move ahead with identifying what may change or what will require further research before a final decision can be made.
- **Define the project team**. The project team should include the project developer and the technical specialists that will be working on the project, including environmental specialists and geothermal specialists (e.g., reservoir engineers, well drillers, etc.).
- **Understand potential issues.** Research and understand the common issues that arise with geothermal projects, as well as the unique issues that may arise for your project. (Refer to Chapter 4 for a summary of geothermal issues).
- **Define approaches to data collection and mitigation**. Understand the mitigation that is typically required for the issues that may arise. Taking a proactive approach by acknowledging the constraints and proposing mitigation early in the process will facilitate a smoother permitting process.
- **Be prepared to follow up and meet commitments**. Once the outreach process has begun, be prepared to progress quickly. Meeting commitments will be important to gain and maintain the trust and respect of the agencies and the public.

CHAPTER 2:
Outreach Methods

2.1 Determining the Outreach Audience

A wide variety of stakeholders participate in the environmental review and permitting process for geothermal projects. Each stakeholder has a different interest in and perspective on the project and can have different goals regarding geothermal development. Most stakeholders benefit from education on the need for, impacts of, and benefits of geothermal energy.

> *"It is the nature of the beast…that people who will be hurt by a project want to become directly involved in a project, but that those who will benefit from a project prefer to remain on the sidelines."*
>
> -Institute for Participatory Management and Planning
> *Citizen Participation Handbook*

It is best to communicate and involve interested parties early in the process. The methods of education may differ by group, and therefore, it is important to also research each intended audience to identify their decision-making authority, motivations, and concerns.

The first step in the outreach process should be to identify the stakeholders and interested parties. The stakeholders are identified based on the:

- Project location
- Land ownership
- Type of project
- Potential environmental impacts
- Land uses and adjacent land uses

The entities identified in Tables 2 and 3 include potential stakeholders that may be interested in geothermal developments. While each development will have a slightly different group of stakeholders, and this is certainly not a comprehensive list of all that may be interested, it is a good place to start when formulating an outreach plan.

Engaging with each of these entities can be done in a variety of ways. Generally speaking, reaching out to each of these stakeholders is best achieved by simply calling their offices or homes to inquire about the appropriate contact person. Scheduling a meeting after a brief conversation on the phone is usually the next step.

While many policies require a public notice of some sort, this is usually not satisfactory to stakeholder groups. For example, if the policy states that a developer must post a notice in the local or regional newspaper and that is all the developer does, the stakeholders will feel left out

Table 2: Example of Potential Stakeholders in Geothermal Projects

Sector	Examples
Government Agency Staff	*Local* Planning Department Public Works Department Building Department *State* Department of Fish and Game Regional Water Quality Control Board Air Pollution Control District Department of Oil, Gas, and Geothermal Resources (DOGGR) Parks and Recreation State Lands Commission Governor's Office of Economic Development (GOED) *Federal* Fish and Wildlife Service Army Corps of Engineers Bureau of Land Management Forest Service Bureau of Reclamation National Park Service United States Geological Survey
Native American Tribes	Traditional territory Adjacent land users
Politicians	Planning Commissioners County Supervisors City and County Councils State Assemblymen and Senators Mayors Congressional Members
Land Owners and Managers	Adjacent land owners Lessees Easement holders Agencies for management of resource or surface property (see list above)
Environmental Groups	Sierra Club Audubon Club Center for Biodiversity Local organizations
Recreation Groups	Off-highway vehicles

Sector	Examples
(Table 2 Continued)	Snowmobilers Hunters Hikers Mountain bikers, etc.
Business Organizations	Chamber of Commerce Rotary Lions Club
Schools	Public Schools (Kindergarten – 12) Private Schools (Kindergarten – 12) Universities/Colleges
Labor Groups	California Unions for Reliable Energy (CURE)
Water Users	Farmers and ranchers Water agencies Irrigation districts
Other	Anyone that may hold interest in the land. If it is Federal land any American citizen has legal standing as an interested party.

Table 4: Regulatory Permits and Issuing Agencies for Geothermal Projects

Role	Agency
Federal and State Land Management Agencies	Bureau of Land Management (BLM)
	United States Forest Service (USFS)
	Bureau of Reclamation (BOR)
	United States Department of Defense (Army, Navy)
	State Lands Commission (SLC)
Federal Funding	Department of Energy (DOE)
Endangered Species Permitting	United States Fish and Wildlife Service (USFWS)
	California Department of Fish and Game (CDFG)
Well Permitting	California Department of Oil, Gas, and Geothermal Resources (DOGGR)
Wetland Permitting	United States Army Corps of Engineers (ACOE)
	State Water Quality Control Board and Regional Water Quality Control Boards CDFG

Role	Agency
Air Permits	Regional Air Quality Management Districts or Air Pollution Control Districts
Hazardous Material Permits	Environmental Protection Agency (EPA)
Power Plant Permitting for Projects over 50 MW	California Energy Commission (CEC)
Local Land Use/Zoning/Building Permits	Local County or City Planning Departments
Water and Waste Discharge	Regional Water Quality Control Board Local Water District or Groundwater Management District California Department of Toxic Substances Control (DTSC) Certified Unified Program Agencies (CUPAs)

and disrespected. The goal of outreach is to get early participation and build consensus among stakeholders. Therefore, early engagement is important and developers would be wise to go beyond the policy requirements.

2.2 Required and Recommended Outreach

2.2.1 Required Outreach

As outlined in Section 1.4.1, outreach can be driven by legal requirements. Legal approvals could include CEQA review, NEPA review, federal and or state ESA permitting, NHPA compliance, Clean Air Act (CAA) permitting, CWA permitting, etc.

CEQA and NEPA review is usually performed during the early stages of project development, when approximately 30 percent of the engineering has been completed. The regulations are specifically aimed at public disclosure of actions that require a discretionary approval on behalf of an agency. The CEQA and NEPA process is used to define a project and to define how the project will affect various environmental receptors or resources. The CEQA and NEPA processes have various required outreach components as summarized in Table 4.

2.2.2 Recommended Outreach

Performing only the legally required outreach can end up costing a project proponent more time and money in the long run due to controversy. Developing a relationship with the community outside of the legal requirements is advised for any project that is located in proximity to a community or for which communities have been historically active in geothermal or other development.

Engaging specialists to develop a project message may be appropriate for large-scale projects in areas where previous projects have generated considerable controversy. The message should focus on the experience of the team, the commitment to evaluation and mitigation of Table 4.

Table 4: Summary of the Outreach Process within the CEQA and NEPA Process for EIRs or EISs

Outreach Method	Required or Optional	Explanation	Timeline
CEQA			
Notice of Preparation	Required	Required prior to preparation of an EIR; sent to the State Clearinghouse, responsible, trustee, and involved federal agencies, and any parties previously requesting notice (Guidelines sec. 15082(a)). The notice must include a brief description of the project and project location, probable environmental effects, where to send comments, and date, time and place of a public hearing (if one is held); must be posted on the County Clerk's office for 30 days as per Public Resources Code (PRC) 21092.3	30 days
Scoping meeting *(Table 4 Continued)*	Optional	The scoping meeting is not required, but if one is provided, should include a presentation of the materials in the scoping notice. Comments should be recorded. The meeting should be noticed in local newspapers.	During 30 day Notice of Availability (NOA) circulation
Draft EIR	Required	A 45 day public review of the draft EIR is required. A Notice of Availability (NOA) must be prepared and issued to interested parties and agencies. The public notice must be published in a newspaper of general circulation, posted on and off the project site, or directly mailed to owners and occupants of contiguous property and posted at the County Clerk's	45 days (CEQA)

Outreach Method	Required or Optional	Explanation	Timeline
		office for 30 days. A Notice of Completion (NOC) is also prepared and submitted with copies of the document to the State Clearinghouse. Comments from the public are accepted during the 45 day review period.	
Draft EIR public meeting	Optional	A Draft EIR public review meeting is not required but most agencies hold a meeting as part of the CEQA process to present the details of the Draft EIR, including its findings, and to solicit comments.	During 45 day review period
Final EIR and Mitigation Monitoring Program	Required	The final EIR is prepared, that addresses responses to the comments received on the Draft EIR. A mitigation monitoring program must also be prepared that describes the methodology for implementation of mitigation identified in the EIR.	Typically at least 1 month after the end of the public review period
Final EIR Hearing *(Table 4 Continued)*	Required, public hearing component optional	A lead agency must provide a copy of its responses to any public agency that submitted comments at least 10 days prior to certifying the EIR (PRC 21092.5(a)). Most agencies include a public hearing prior to making a decision on the Final EIR.	After issuance of the final EIR.
NEPA			
Notice of Intent (NOI) to Prepare an EIS	Required	Required prior to preparation of an Environmental Impact Statement (EIS); sent to the Federal Register, responsible, trustee and involved federal agencies, Native	30 days public review

Outreach Method	Required or Optional	Explanation	Timeline
		American tribes, and any parties previously requesting notice. The notice describes the scope of the EIS, issues, alternatives, and analyses.	
Scoping meeting	Required	One public scoping meeting is required. The meeting should include a presentation of the materials in the scoping notice. Comments should be recorded. The meeting should be noticed in local newspapers. Comments received during the scoping process are considered in developing the scope of the EIS. Additional meetings can be held, but are not required.	During 30 day NOI circulation
Draft EIS	Required	A 60 day public review of the draft EIS (public comment period) is required. A Notice of Availability (NOA) must be prepared and published in the Federal Register.	60 days (NEPA)
Public Hearing	Required	At least one public hearing is required.	During 60 day public review.
Final EIS	Required	Following the public comment period, a final EIS is published and distributed. Consideration of public comments on a draft EIS during preparation of a final EIS is required under NEPA	After public review period. Usually required a month or more of time to address all comments and prepare the final EIS.

(Table 4 Continued)

Outreach Method	Required or Optional	Explanation	Timeline
Record of Decision (ROD)	Required	The ROD notifies the public of the decision made on the proposed action and the reasons for that decision. The ROD also includes a discussion of any other factors considered in making the decision, such as cost, technical feasibility, agency statutory mission, or national objectives	A required minimum 30-day waiting period is required before a Record of Decision can be issued in the Federal Register
Native American Consultation	Required for projects with a federal lead agency	A good faith effort to reach out and consult with Native American Tribes is required by the National Historic Preservation Act. The lead agency usually spearheads this effort and it can include providing letters soliciting input on a project, attending a site visit with the tribe, attending tribal meetings, etc.	Typically begins at the scoping period and continues until the requirement of good faith effort is fulfilled, which is usually the duration of time to the Final EIS

environmental impacts, the sharing of monitoring results with the public, and the overall community benefits (e.g., tax revenue, jobs).

2.3 Outreach Opportunities by Project Development Phase

2.3.1 Pre-Environmental Review

2.3.1.1 Choosing the Initial Outreach Contacts

Outreach prior to the environmental review phase of a project is not required but is highly recommended. The outreach process can start soon after the inception of the project idea, depending upon the community and existing geothermal development, level of controversy expected, etc. An overall message should be assembled once the basic design and land position have been determined and secured.

The first party to hear about the project should be carefully determined. In most cases, the first entity notified should be the key regulators, as they can provide critical input in terms of the regulatory process for the project, any key issues that they may be privy too, or regulatory hurdles that the project proponent may not have considered. Some project changes may need to be made as a result of the information learned during initial contact with the regulators. It is generally easier to make such changes at this early stage of the project before a lot of resources and time have been committed. Another reason for notifying the regulators is so that they can field questions from the public once the public is notified.

A common project pitfall is to spread the word of a project in a community before going to the regulators. If a community member calls the regulator asking about the project, and the regulator has not been approached, the project and project proponent can lose credibility. Tribes should also be notified early in the process, preferably prior to notification of the general public. Government agencies have an obligation to notify the tribes prior to the government agency notifying the public.

> *"An effective citizen participation program can provide valuable design information to the project staff."*
>
> -Institute for Participatory Management and Planning
> *Citizen Participation Handbook*

Individual phone calls or in-person meetings can be scheduled to provide the lead agency contacts with information. Often, the initial meeting with the concerned regulators is an informational meeting. The lead contact from the development company should attend initial agency meetings and the company's past experience and track record with development of renewable energy projects should be emphasized.

Initial Public Outreach

Once the regulators are notified, key community members that would support the project should be approached, such as geothermal or renewable energy interest groups, legislators, etc., followed by the general public. Public outreach can include holding an initial information meeting to present project ideas and accept comments. In some cases, such as when there are multiple options for a transmission line route, it may be advisable to hold these meetings as part of a feasibility analysis to get a feel for the community's reception to development and to identify the most problematic areas that can potentially be avoided during project design. These meetings should include a short presentation that includes the following: (Refer to Appendix D for an example presentation.)

- Introduction of the developer, including previous projects experience

- Overview of geothermal resources and technology
- Proposed development, including clear, legible maps
- Expected environmental review and permitting process
- Expected impacts from project development
- Expected mitigation measures
- Anticipated schedule
- Community benefits
- Public participation in the process
- Contact information

This initial presentation can serve as the basis for many future meetings, including workshops and open houses. Each topic may be expanded to match the time available and level of detail necessary.

2.3.1.2 Creating a Master Contact List or Database

During the pre-environmental study outreach phase, a *Master Contact List* should be developed for the project. This list will facilitate the outreach efforts throughout the life of the project. The list should include names, phone numbers, emails, and web pages of contacts as well as a column or entry that includes a summary of each party's interest, decision making authority, or other role in the project based on the research conducted. This list should be compiled as early as possible, such as during project conception and feasibility studies.

Interested parties can be identified in many ways. Though the initial list is most often generated by the project proponent. As a project progresses, the list will grow and other parties and agencies can contribute to it.

Box 1

REAL EXAMPLES

Initial Scoping and Outreach for the Newberry EGS Demonstration Project

The Newberry Enhanced Geothermal Systems (EGS) Demonstration project is part of the U.S. Department of Energy's Geothermal Technology Program. The demonstration is a joint partnership between AltaRock Energy, a renewable energy development company focused on the research and development of Enhanced Geothermal Systems, and Davenport Newberry, which specializes in the development and management of geothermal opportunities. The site is located near La Pine, Oregon.

In 2009, an EGS project in Switzerland was shut down because it triggered small earthquakes in an area that was otherwise seismically "quiet." The story made the New York Times front page and put future US EGS projects in jeopardy. Public outreach would be critical to regain confidence in the new technology.

AltaRock and Davenport Power announced the successful completion of three public outreach meetings in October 2010. The community outreach meetings, that began in July, facilitated open dialogue between the AltaRock Energy-Davenport Newberry team and interested individuals and parties throughout Deschutes County and the state of Oregon. The meetings were well attended and provided a valuable opportunity for the team to collect public feedback, questions and concerns, and for the public to receive accurate information about plans for the demonstration (PRWEB 2010). Concerns included water consumption, water quality, induced seismicity, and visual impact. These three scoping meetings allowed the BLM to determine that an Environmental Assessment should be prepared for the project. Early outreach helped shape the issues addressed in the EA.

The project also has a Facebook page that says:

> "Welcome to the Newberry EGS Demonstration Facebook page! We will be posting, explaining and sharing news and information about the power and promise of Enhanced Geothermal Systems (EGS.)"

The page includes a brief description of the project, provides a link to the project's website, photos and maps, and links to news stories. At the time of this writing the project already has 170 followers. The page can be accessed at the following address:
http://www.facebook.com/NewberryEGS

The Master Contact List

A project proponent can generate the initial contact list by doing the following:

1. Examine previous CEQA or NEPA documents for nearby or similar projects
    a. Note what organizations, groups, agencies, and individuals made comments on the environmental document

2. Call local agencies to understand the required permits, the issuing agency, and any concerns that the community may have
    a. Start at a local level with a planning or building department, as the local agencies have the most knowledge of the local community and how the regulations are implemented

3. Follow the news
    a. Sign up for Google News Alerts on geothermal developments to track news stories that may identify interest groups, latest agency updates, and the latest legal decisions.

4. Join ***social media*** groups such as Twitter, Facebook, and LinkedIn
    a. Track who follows other geothermal projects and geothermal groups such as the Geothermal Energy Association, the Geothermal Resource Council and the California Geothermal Energy Collaborative.

5. Contact colleagues and ask about their experiences and whom they may think could be interested in the project
    a. Environmental consultants have often worked in many areas and on many projects and may have useful insight as to who may be interested in a project in a particular region.
    b. Members of trade associations may also have recommendations

As a project proceeds, the project proponent should update the list with individuals who express interest during the environmental review process, during public meetings, through other public outreach methods, or through direct contact. The project proponent should set up a primary contact with each party of concern to collect new contacts, and manage public input and comments.

Agency and Public Participation in Identifying Interested Parties

Agency staff, stakeholders, and the general public can also help with the identification of interested parties. Agency staff may maintain their own stakeholder and interested parties lists. These contacts are often stored in a database and can be used for identification of interested parties on future projects in the same region. The list should be obtained by the proponent as early as possible.

Agency staff should also identify a designee or point of contact for each project, as feasible. This person will communicate with the proponent, the public, and other cooperating agencies. Public

outreach and communication is best facilitated through an agency contact that has knowledge of the proposed project and project history.

Updating the Master Contact List

The *Master Contact List* should be maintained and updated for the life of the project. The list should also be used to track the interests and activities of various groups and agencies and to periodically reach out to the interested members for feedback on the process and the project operations. All contact with the public and agencies should be documented for future reference. A project's proponents and agency staff can track the public outreach contacts and efforts through a simple spreadsheet, word processing table, or a database.

2.3.2 Environmental Review Outreach

Outreach opportunities during the environmental review phase can include public hearings or meetings during the scoping period and during review of the draft environmental document. These meetings should be held at a public facility and during the evening to maximize attendance. Other opportunities during the environmental review phase include holding workshops as data from the environmental analysis become available, and updating websites with these results. Workshops may be held to focus on issues of particular interest or complexity, or to update the public on project progress.

Agency meetings or contact should be ongoing through the environmental review process. The applicant should provide regular updates to the regulating agencies. Early consultation on study scopes, survey methods, findings from surveys, and potential mitigation should be vetted with the agencies. Investing in this effort can shorten the agency review time of permit applications and the environmental document and can minimize the number of comments received.

2.3.3 Project Construction and Operational Phases

Outreach should not stop after the completion of the environmental review process. During construction, monitoring results will likely need to be shared with the regulatory agencies. Setting up bi-weekly calls with the team of regulatory agencies that permitted the project (e.g., the local jurisdiction, Fish and Game, USFWS, the Air Resources Board, the Water Resources Board) is a good way to communicate the implementation of mitigation, the project's construction progress, and to address any issues that may arise. Preparing a final report of lessons learned may also be advisable to show what impacts and mitigation measures were critical, what perceived issues may not have been real issues in the field, and what issues arose that were not considered during the environmental review. This feedback to the lead agency will help increase the efficiency of future projects.

Communication with the community should continue at a level that matches their level of interest. Once construction is complete, having a ribbon cutting ceremony and inviting the agencies and the public can help bolster the sense of accomplishment and support for the project. Tours to educate the public, community, and landowners on how the facility works can also be a part of the ongoing outreach process. Ongoing monitoring, such as of groundwater levels or quality, noise levels, air emissions, and seismic data should be summarized and made available to the public and agencies over the life of the project. Establishing a hotline or email contact for emergencies or concerns should also be implemented and any comments received

should be addressed immediately. Self-guiding of incidents is often a good public outreach tool to demonstrate honesty and commitment to following the law, which will ultimately improve the relations with the community and regulators.

2.4 Outreach Strategies by Audience

2.4.1 Summary of Strategies

Outreach strategies should be carefully planned to address the unique needs of each interested party and should consider the phase of the project. A combination of general outreach strategies and tailored strategies should be included in a good outreach plan. Each audience will have a different goal, stake, or concern. Too much information or too technical of a presentation can cause people to become quickly overwhelmed, to lose interest, or to become confused. It is important to tailor the information presented to each party to focus on their major concerns.

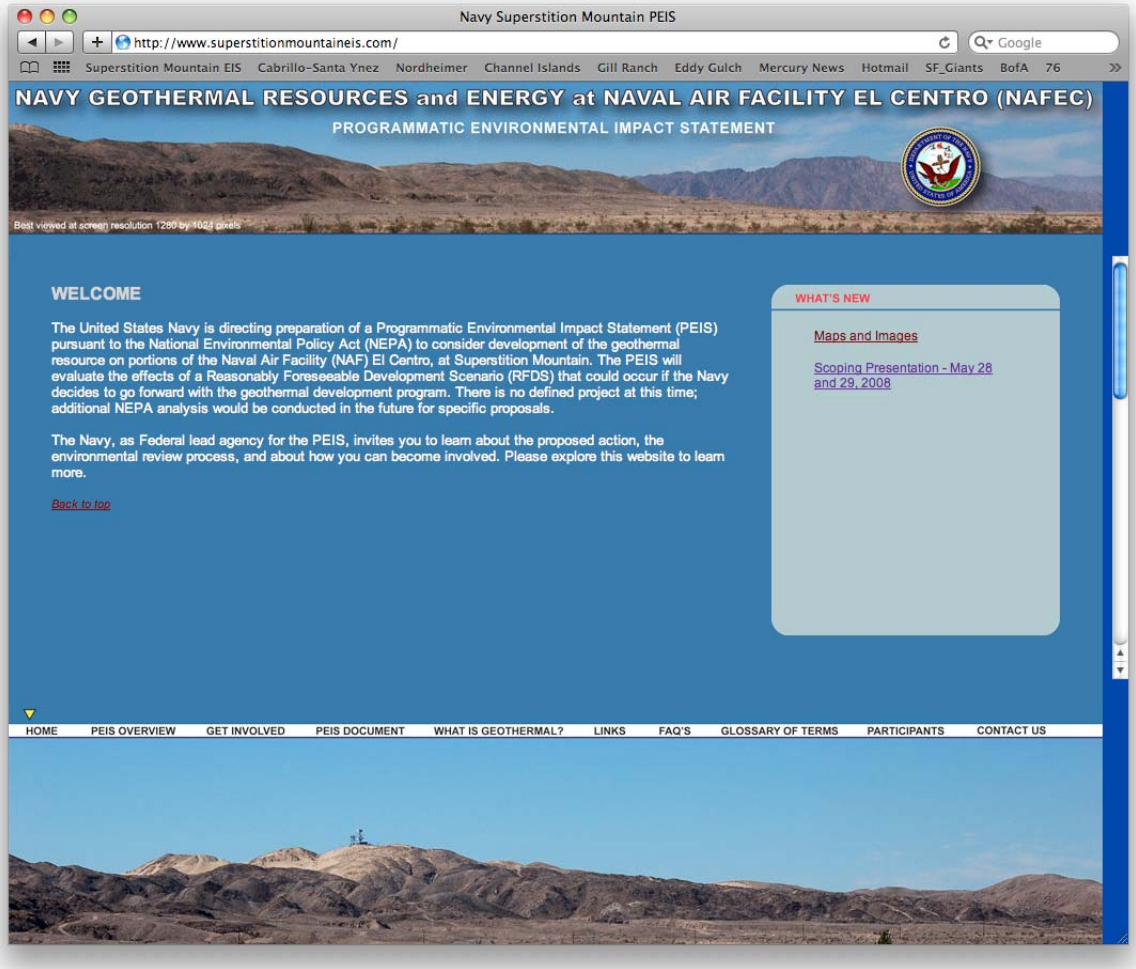
> *"Frequently, obstacles to development arise from poor communication between parties with diverse interests."*
>
> -William Graham
> *The Effectiveness of Consensus Building in Renewable Energy*

Basic outreach methods include:

1) Identify lead and permitting agencies and stakeholders
2) Develop informational materials related to common misconceptions about geothermal development, such as the potential impacts of air emissions deposition and water quality, the frequency and nature of well blowouts, the contamination of groundwater, and the depletion of the geothermal resource.
3) Define techniques for early public education and involvement, some of which may include:
    a) Initiate and fund a community committee to receive intensive education on the proposed project, geothermal development in general, and the environmental effects of exploration, development, operation, and decommissioning.
    b) Conduct community informational workshops or open houses at a local public facility (community college, high school, etc.).
    c) Establish a staffed local field office early in the process with informational materials available and a staff person who is specifically committed to working on outreach.
    d) Set up a website providing information on the proposed project, environmental protection measures, the decision-making process and factors, and opportunities for public input (see the example home web page, Figure 2).
    e) Arrange for site visits to better educate the public about the area and to indicate how various constraints have been considered in the project location and design.
4) Involve stakeholders in defining scopes of work for baseline data collection.

5) Establish a point of contact early on in the process and use consistency throughout the project to field concerns from the public, with priority given to providing prompt response to any complaints or questions.
6) Meet with concerned parties as necessary, either one-on-one or in a group setting or workshop to address their concerns.
7) Prepare standard quality control and Guiding methods for monitoring data related to air emissions, air and water quality, and other parameters of concern, where applicable.
8) Identify industry-wide approaches to mitigation of potential impacts, such as odor impacts from hydrogen sulfide, visual impacts, loss of habitat, construction in roadless areas, and effects on hot springs.

Figure 2: Example Project Website



Each of the audiences outlined in Table 5 will have an interest in cost projections. Cost projections should be tailored to the audiences concerns.

Table 5: Approach to Cost Projections by Audience

Group	Approach to Cost Projections
Public Agencies	Include estimates of the time and costs associated with use of public resources to review permits and to implement mitigation. Projected tax revenues and employment opportunities should also be presented to the public agencies
Non-Governmental Organizations (NGOs), Community Groups, and the Public, Tribes	Benefits could include employment. Overall project costs can be presented. Tax and other community financial benefits should be presented.
Legislature	Total project costs, including all permitting and monitoring costs should be presented.

2.4.2 Outreach to Public Agencies

Agency staff and decision makers involved in the approval process for geothermal projects are a critical audience for outreach. The agency staff will play an important role in communicating their knowledge and understanding of the project to the decision makers and the public.

The outreach effort should emphasize education and participation in the early phases of project development, as well as in the formulation of research and monitoring methods. Outreach to public agencies should be accomplished in several ways:

1) Identify the key personnel in each agency and assure that regular contact is maintained with that person or group of persons, through meetings or other communications. In addition to the decision maker, you will need to know the agency project manager for your project and staff who will review the project, including biologists, archaeologists, hydrologists, etc.
2) Solicit agency input into the development of data collection efforts and monitoring programs.
3) Share the results of research, data collection, and monitoring efforts with the agencies, including presentations or newsletters directed to the relevant staff and decision makers.
4) Invite agency staff and decision makers on site visits to view existing operations or potential sites for development or to solicit their ideas regarding how to address a specific concern.
5) Invite agency staff and decision makers to attend industry conferences and seminars.
6) Involve agency staff and decision makers in committees or other meetings to solicit input regarding techniques to mitigate potential impacts that are likely to be of concern on a project.

Be prepared for the initial meetings with the regulators. Know the focus, purpose, and role of the agency, the authorization needed for the project, and key concerns of the regulator. Be prepared to address those concerns. Prepare background materials (brief project overview, maps, etc.) and a proposed agenda for the initial meetings in order to facilitate a meaningful

discussion on concerns and potential obstacles while the project can still be modified. Provide meeting notes to capture key points discussed at the meetings and a list of action items. Follow up promptly on action items.

It is also very important to demonstrate technical knowledge when meeting with technical specialists at the agencies. This knowledge can be demonstrated by consulting with specialists prior to meeting with the agencies and potentially bringing specialists to the meetings to show commitment and good faith. It is equally as important to share monitoring results, interpretations, and adaptive management practices for ongoing projects and to solicit input from regulators in a proactive manner.

Establishing a website, file transfer protocol (FTP) site, or other system of communication with the agency contact can facilitate the communication of data. Fostering a good relationship for the duration of a project is important because it equips the agency contact with information in case of inquiry by the general public, and it supports confidence and trust in the developer by the agency.

2.4.3 Outreach to Non-Governmental Organizations (NGOs), Community Groups, and the General Public

Outreach to the general public should focus on educating the public as to how geothermal power development works, its benefits, and impacts on the environment. Initial scoping meetings with the public should not be bogged down with technical details. The meetings should focus on the big picture:

- What is geothermal energy?
- Who is the developer?
- What is the project?
- Where is the project?
- What will it look like?
- How will it be built and operated to protect the environment?
- How can it benefit the community?
- What are the key environmental issues?
- What are the methods to provide input and concerns to the developer and agency?
- When will the project be built?

As the project moves into the environmental review phase, specific public or interest groups' concerns will become apparent. The outreach should be tailored to address these specific concerns. It may be beneficial to initiate (and fund) a community committee to receive intensive education on the proposed project, geothermal development in general, and the environmental effects of exploration, development, operation, and decommissioning. Having experts with experience in geothermal energy development provide input into the outreach process with the NGOs and the general public is critical. Holding workshops and community meetings may also be important if controversy arises.

Honesty regarding the potential impacts of a project is important. Presentations should be modified for the understanding of the audience. Most of the audience is likely to not have a scientific background, so concepts need to be explained as simply as possible. Meetings with the public should focus on the concerns raised and should clearly demonstrate either why those concerns are not an issue, or how the project has been modified to address the concerns. The public should be presented the opportunity to see monitoring or other data that are available and can help them understand the true impacts of a project.

When dealing with the public in any capacity, care should be taken to be understanding and non-confrontational. Concerns should be acknowledged and all commenter's must be treated with respect. The developer (or agency) should designate a contact person for all public outreach efforts. The same person should represent the project throughout all phases of the project, as this person will develop the relationship with the public and will have a good understanding of the project history and concerns that may arise in the future.

Sometimes, an organization or group just does not want a project—not in my backyard. In these instances, it is particularly important to reach out to the community members early in the process to receive their input in the project design. Early outreach has the best chance of eventually swaying such community members to support a particular project. Presenting facts that are responsive to concerns is important, as is stressing the environmental and economic benefits of the project.

2.4.4 Outreach to Tribes

Projects on federal land or receiving federal funding are subject to NEPA and require formal tribal consultation. Consultation between the federal agency and the local tribes must be conducted "government to government." This means that the decision maker at the agency must meet with the decision maker(s) at the tribe, which is usually the tribal chair and/or tribal council. It is also important for the agency staff to consult with the tribal staff, but do not mistake staff consultations with government-to-government consultation. A good faith effort to consult with tribes must be demonstrated in accordance with the law; going beyond the legal requirements is advised.

Geothermal projects are often located in areas of historic and prehistoric Native American habitation, where these groups continue to use the land for traditional practices. Hot Springs are often sacred sites and as such, may be protected under Executive Order 13007 (Indian Sacred Sites). Initial outreach should include identifying and understanding the tribes that may have historic use or interest in the region and tribal values in the project region. Consider tribes within an area larger than just the immediate vicinity of the project as tribes often moved over larger areas or traveled distances to sacred sites.

An archaeologist should be brought onto the project team for any project that could result in ground disturbance. The archaeologist can query the Native Lands Files and the Native American Heritage Commission for any known Sacred Sites.

The first step in Native American outreach will be to prepare an initial scoping comment letter. This letter will be sent by the federal lead agency; however, the developer should provide details including a summary of the proposed project and a summary of potential environmental effects and how they will be addressed.

Depending on the location and the activity of the tribe, additional consultation may be required. Field visits should be scheduled to show interested tribal members the proposed location of facilities in the field and to listen to Native American concerns and uses. If an archaeological survey has been completed, the archaeologist should also attend the site visit.

To facilitate outreach with Native American tribes, it is important to understand their culture and concerns. Applicants and agencies should work with tribal councils, members, and staff throughout the process to prepare monitoring and mitigation programs that address their issues. Sometimes, more intensive outreach such as ethnographic studies should be conducted and the results shared with the tribes. The efforts made to address specific concerns should be presented in the subsequent outreach, such as changing project features to avoid any significant resources, providing measures to minimize effects during certain ceremonial times, and employing a Native American monitor during construction or to work on the construction.

Every correspondence and outreach effort with the tribes must be documented. Native American issues can often cause opposition to a project and major delays. While not all issues may be resolvable, it is particularly important to educate the tribal members on the actual science and effects (if they have misconceptions) and to clearly identify the efforts made to accommodate the tribal interests.

Another noteworthy consideration when dealing with cultural resources is 22 CFR 1104.17 regarding the Confidentiality of Archaeological Resource Information. Locations and the nature of archaeological resources should not be revealed to the public during outreach or in the environmental document in accordance with this statute in order to protect the resources.

2.4.5 Outreach to Legislature

Legislators and agency board members involved in the development of rules and regulations that affect the geothermal industry are another critical outreach audience. These policy makers are typically more interested in the larger benefits and impacts of geothermal development, and less interested in the details. One of the main purposes of outreach to policy makers is to provide feedback on processes with regulatory agencies on how they could be more efficient and effective. The key approaches to outreach to legislators are to:

1) Establish a relationship with the policy makers through meetings with them or their key staff and regular follow-up communication. Meetings are the most effective form of contact, assuring the policy maker's full attention. Someone in a senior capacity should be designated as a regular contact for each policy maker. Legislative aides can be reached by email or phone.
2) Arrange site visits or tours of facilities for policy makers and their staff to familiarize them with the on-the-ground constraints and/or operations of geothermal development. Inviting decision-makers to visit a functioning geothermal site is an excellent opportunity to highlight the benefits of geothermal energy, to describe how a geothermal facility operates, and to explain the surrounding issues.
3) Provide concise background educational materials outlining the benefits of geothermal energy development. Some key components of this information could include the reliability of geothermal energy, the environmental impacts as compared to traditional sources of energy, the benefits of energy diversity and independence, the relative costs

compared to other alternative energy sources, and the socioeconomic impacts for a community, especially job creation and increased local tax revenues.

4) Provide concise information about the industry or the developer's efforts to work with interested parties. Address key issues that are likely to arise during the environmental and permitting process or in the course of considering legislation. This presentation should clearly distinguish between a) misconceptions about certain types of impacts, b) other impacts that may be effectively mitigated, or c) still others that are acknowledged as being unavoidable.
5) Provide feedback to policy makers on particular regulatory processes and how they can be improved. Provide concrete examples of ways in which current systems may not be working properly and make suggestions for legislative or policy solutions. Consider working with other developers, agencies, and interest groups to make a case and to show support for change.

The key to effective outreach with policy makers is to provide them with succinct and timely information and to consistently conduct follow-up.

2.5 Outreach Tools

2.5.1 Overview

Several tools are available for public outreach. This section describes each of the tools available. Tips and recommendations on how to prepare various types of outreach tools (e.g., presentations, brochures, and public meetings) are presented in Appendix C.

2.5.2 Traditional Media

The outreach program may start with compiling concise educational materials outlining the benefits of geothermal energy development to be dispersed in traditional media (e.g., brochures, newsletters). Key components of this information could include:

- What is geothermal energy
- The reliability of geothermal energy
- The environmental impacts as compared to traditional sources of energy
- The relative costs compared to other alternative energy sources
- The socioeconomic benefits to the community (i.e., job creation and local tax revenue)

"Social technologies can make networking and engagement with the public simple and powerful, make research faster, identify influencers in useful micro-niches, provide mechanisms for combating negative publicity, and measure public sentiment to help inform public policy."

-Mark Drapeau
Government 2.0: How Social Media Could Transform Gov PR

As the project progresses, this information can be updated with more project specific details, such as:

- Project location maps
- A summary of project progress, including any public meetings that were held, the design process, the environmental review process
- A summary of anticipated impacts and methods for mitigating the impacts and those impacts that are unavoidable
- A summary of common misconceptions about impacts and evidence to demonstrate why these are misconceptions.

Brochures or newsletters are a good method for communicating project information. Other media such as a website and social media should also be explored (discussed below). Soliciting specialized design expertise to develop a professional looking packet of information is important to show that the project is real and that the proponent is credible. Use outside reviewers to evaluate the message and to provide feedback on clarity and understandability for each intended audience. Refer to Appendix C for details on how to prepare effective brochures and newsletters, including graphics, content, and writing style tips.

2.5.3 Social Media and New Technology

Social media is a relatively new tool that in a matter of a few years, has revolutionized the way in which people communicate. Social media is the use of web-based and mobile technologies to turn communication into interactive dialogue and is ideally suited for public outreach programs for geothermal development. Many social networks exist, but right now, the primary sites include Twitter (Figure 3), Facebook, and to a lesser extent, LinkedIn.

Traditional outreach in geothermal energy has depended on conventional communication methods (i.e., meetings, letters, informational brochures, newsletters). While social media may not be a familiar tool to project proponents, parties interested in the project are likely using it. It represents a low cost method to reach very broad audience and accelerate the rate of information flow. Using social media also shows that a company is modernized, forward thinking, and open, which are all traits of conscientious companies as perceived by the public.

A project proponent should establish both a project website and a Facebook page after they announce their project and are ready to begin educating the public. The stage to start a Facebook page is when enough detail is known about the project to provide a basis for conversations. Keep in mind that once a Facebook page is created, the information on it is public and traceable. A daily monitor should be assigned to manage the page, posts, and comments.

The Facebook page should include photos of the project area, a summary of the project, and any additional information about the project that would benefit the community. Post events on the Facebook page and provide links to relevant informational websites. Slideshows or video can also be linked to the Facebook page. Creating a virtual tour of the project area and making it available through YouTube (which can be linked to a Facebook page) can reach a broad audience. Comments and questions can also be posted real-time as well as responses.

To start meaningful conversations, follow other groups, organizations, or individuals that were previously identified in the *Master Contact List.* Providing comments or links on their sites can

create exposure to grow a following and to engage a meaningful conversation on a proponent's project.

Other ubiquitous media such as Slideshare and YouTube can also be important tools. Slideshare allows the posting of any presentation and is searchable by topic. Create a series of slideshows and be sure to link them to other social media pages such as a Facebook page and the company's project website.

Figure 3: Example Twitter Page for a Geothermal Company

2.5.4 Tours, Open Houses, Workshops, Training

Another general outreach method is to provide project tours and workshops. Tours and workshops can be tailored to meet the needs of the specific audience. A representative from Fish and Game may be particularly concerned with a stream crossing or proximity of project

features to natural resources. The general public may be interested in understanding how a project will work and where the components will be located relative to residential or recreational areas. A tribe may be interested in seeing specific resources such as hot springs, waterways, or archaeological sites.

Workshops and open houses can be held throughout the development process. These forums allow for presentation of material of a general or focused nature and can be coupled with tours. Workshops are a good opportunity for scientists and specialists to give detailed presentations on topics where concerns have arisen. These workshops should be interactive and focused on specific topics. The specialist should be prepared with presentation materials and should anticipate questions that may be asked. An important point is to also ensure that presentation materials, while technical, are explained in a way that can be understood by the audience. Refer to Appendix C for additional tips on preparing and giving presentations. The workshops should be held at a local public facility (community college, high schools, etc.).

Initiating and funding a community committee to receive intensive education on the proposed project, geothermal development in general, and the environmental effects of exploration, development, operation, and decommissioning may also be advisable.

Box 2

REAL EXAMPLES OF COMMUNITY OUTREACH

On-Going Community Involvement at Calpine-Geysers

Calpine-Geysers is the largest complex of geothermal power plants in the world. Calpine, the largest geothermal power producer in the U.S., owns and operates 15 power plants at The Geysers with a net generating capacity of about 725 megawatts of electricity (enough to power an entire city the size of San Francisco).

Renewable power generation at The Geysers has occurred for over 50 years. Calpine continues to reach out and educate the public through a robust program that includes a state-of-the art visitor's center, monthly community tours, and free events, such as the 2011 Earth Day event that included a guided bus tour, music, demonstrations, booths, activities, live entertainment, and educational presentations. The guided tours take participants through a geothermal field and demonstrate what a geothermal power plant looks like and how it works.

CHAPTER 3:
Outreach Approaches to Specific Issues

All energy projects can generate environmental impacts during construction and operation. It is important to understand these impacts in order to understand how to develop and implement the outreach strategy. Traditional power generation generally has greater environmental impacts than geothermal energy production, such as air emissions and greenhouse gases, which is often emphasized during outreach. Geothermal energy impacts are typically addressed during the planning and permitting phases of the project. Both actual and perceived concerns should be addressed during outreach to educate the public and alleviate all concerns. Box 3 provides an example of how technical issues were addressed and presented during outreach for The Lake County-Southeast Geysers Effluent Pipeline Project.

Appendix E identifies environmental issues that are often raised by agency staff or the public during the outreach process and demonstrates how they can be addressed during public outreach. [A *Guide to Geothermal Energy and the Environment* by Alyssa Kagel, Diana Bates, and Karl Gawell (2007) is one resource on the environmental issues associated with geothermal development and can be found on the Geothermal Energy Association website (see *Resources* section at the end of this Guide).]

Typical questions about potential or perceived impacts from geothermal development that arise during the public outreach period center on the following topics:

- Air Emissions
- Water Resources
- Cultural Resources
- Visual Impacts
- Hazards
- Biological Resources
- Noise

Some of the identified issues are best addressed with proven mitigation measures and or with effective monitoring. For those impacts anticipated for the proposed geothermal development, materials should be developed outlining mitigation approaches and how impacts will be monitored to assure compliance. Each issue and the approach to developing outreach materials to address the issue are presented in Appendix E. It is important to understand these issues and to have identified solutions before starting outreach.

Box 3

REAL EXAMPLES OF COMMUNITY OUTREACH

The Lake County-Southeast Geysers Effluent Pipeline Project – An Innovative Solution to Water Resource Constraints

Construction of the first commercial power plant began in 1960 for an 11 MW plant at The Geysers. An average annual generation of 2,000 MW was being produced by 1987. Calpine acquired most of the plants at The Geysers by 1999; however, the production at The Geysers was on a slow decline since the daily power output at The Geysers peaked at 2,000 megawatts in 1987. The geothermal reservoir needed to be supplemented with additional injection water to restore the pressures in the reservoir. Finding a source for that injection water was looking grim as surface and groundwater resources were already overcommitted in the region.

Meanwhile, the Lake County Sanitation District (LACOSAN), which provides sewer service to the communities of Clearlake, Lower Lake, and Middletown, found its wastewater systems deficient in terms of both treatment quality and disposal capacity. These deficiencies prompted the state to order LACOSAN to upgrade its treatment process and find a means of disposing of larger quantities of effluent and hence the idea was conceived to use the recycled water for supplemental injection to counter the decline at the Geysers. Supplemental water was brought to The Geysers in 1997 with the implementation of the Lake County-Southeast Geysers Effluent Pipeline Project. The project was the first recycled-water-to-electricity project in the world. The 29-mile underground pipeline delivers 8 million gallons of treated reclaimed water per day to The Geysers to be injected into the geothermal reservoir.

Implementing the effluent pipeline project was a major institutional challenge in several respects. Since it had never been attempted before, it automatically raised technical, legal, and regulatory concerns. It was jointly sponsored by public and private organizations that have historically often been adversarial; but, who found themselves benefitted by a partnership where they could work together toward mutually advantageous objectives. Finally, the complexity of a 29-mile linear facility crossing multiple jurisdictions and dozens of sensitive environmental sites significantly increased the scope and amount of environmental and regulatory scrutiny.

The project's strategy for dealing with these challenges included: 1) an inclusive "open door" policy that emphasized information sharing and collaborative planning among all interested parties; 2) involvement of agency permitting staff in early feasibility studies to insure their familiarity with the project and solicit their input; 3) commissioning of special environmental studies to analyze specific options and questions as they arose, before they could become problematic to the project development process; 4) aggressive information outreach to citizens and civic groups, particularly environmental organizations, to insure their familiarity with the project; and 5) use of consensus decision making to insure that each step of the development process had the full commitment of all stakeholders. The project also emphasized the involvement of state and federal legislators, whose districts were impacted by the project, insuring that they were aware of the problems the project was responding to, and the benefits expected if implemented as planned (Dellinger and Allen 1997).

The Santa Rosa Geysers Recharge Project (SRGRP) was selected in 1998 to bring an additional 11 million gallons of treated recycled water per day to The Geysers through an underground pipeline. The SRGRP project was built and began delivering water to injection wells in The Geysers in 2003. An Addendum to the CEQA Environmental Impact Report (EIR) that evaluated the impacts of increasing recycled water deliveries to The Geysers steam field up to an annual average of 19.8 million gallons per day was approved by the City of Santa Rosa on August 14, 2007.

CHAPTER 4:
Developing an Outreach Plan

4.1 Introduction

An outreach plan can be an important tool that will be used throughout the development process. This section describes how to turn the steps identified in Chapters 2 and 3 of this Guide into an outreach plan.

4.2 Developing an Outreach Plan

4.2.1 Overview

An effective outreach plan should follow these steps:

1. Compile a basic summary of the project and team
2. Identify the project's goals and the purpose and need for the project
3. Determine the intended audiences and research the audiences
4. Define the outreach methods, tools, and timing for each audience
5. Implement the outreach
6. Measure successes and evaluate effectiveness of the efforts
7. Modify and adapt as necessary for success

4.2.2 Outreach Plan Template

The following template can be used to create an outreach plan. The content that should be addressed in each section is described in bullets. The content can be presented in the plan in paragraph or bullet format.

Outreach Plan Template

PROJECT SUMMARY

Identify the Project Team

Focus on the accomplishments of the team members and previous experience in geothermal development.

Provide a Short Summary of the Project

The summary should include the preliminary location and general type of equipment, the anticipated size of the project, the location of the project access, and the potential interconnect or end use of the power or heat generated from the system.

Define the Community Benefits

Summarize the project benefits including baseload renewable power, contribution to Renewable Portfolio Standards (RPS) goals, and new jobs and tax revenue for the local community.

Summarize Environmental Review Process

Summarize the environmental review process, including any permits that will be obtained, and the CEQA and/or NEPA process (as applicable).

Identify Potential Environmental Issues and Mitigation Measures

The environmental review process will do this through a scoping phase. Once completed acknowledge potential impacts, define mitigation measures, and identify any uncertainties.

PROJECT GOALS AND THE PURPOSE AND NEED

Identify Goals

An example goal is "To build a 25 MW binary geothermal power plant on the applicant's leased land that provides renewable power to Southern California Edison within 5 years."

Identify Purpose and Need

The purpose and need should be stated. It will most likely be "to increase renewable energy generation and lessen dependence on fossil fuels and to use a known and viable geothermal resource."

INTERESTED PARTIES AND STAKEHOLDERS

Identify Stakeholders

Make a list of the interested parties and stakeholders. See Chapter 2.1 of this report for the ways in which to determine the stakeholders. Questions to ask to determine the intended stakeholders include:

- *Who manages or owns the land on which the project will be located? [examples: landowners, a federal agency, a state agency]*
- *Who does the project depend upon to come to fruition? [examples: partners and stakeholders, investors, local and state officials, congressmen and women]*
- *Who does the project depend on to spread the message to these people [examples: media, citizens, partners and stakeholders, community groups]*

Generate the Master Contact List

Define each group of stakeholders (and sometimes individual representatives) to identify the most important concerns, approval authority, and motivations for each stakeholder on the Master Contact List.

OUTREACH METHODS AND TOOLS

Identify Outreach Tools

Create a list of the outreach methods that will be employed. Refer to Appendix C for additional instructions on using or carrying out each tool or method.

- ***Printed information.*** *As part of the outreach plan, assemble data and information relevant to the project. Determine who the intended audience will be for different informational and educational packets to be distributed. Have outside reviewers evaluate the message to provide feedback on clarity and understandability for each intended audience. If necessary, use specialized design expertise to develop a professional looking packet of information. Strive for open, honest communication with each intended audience. Be sure to include how to access additional project information, such as on a website, or through informational meetings and workshops.*
- ***Meetings, workshops, and site tours.*** *Identify the types of meetings, workshops and tours that will be held. The plan should identify the location of the events, how to advertise for the events, the content to be presented at the events, and the timing of the events. Generate an inventory of PowerPoint presentations for the project that addresses specific audiences.*
- ***Websites and social media sites.*** *Identify which sites to use, the content, and procedures for updating and monitoring activity on the sites. Designate a site moderator who monitors social media sites daily.*
- ***Set up contacts and hotlines*** *and train a key point person for the outreach effort. The plan should identify this person, how much time will be devoted to outreach efforts, and the training that they will receive.*

Align Audience to Method

Align each intended audience with the methods identified.

- *This section of the plan should align the approach and the outreach materials to each intended audience. This section should also present how the approach to key issues should be addressed and presented.*
- *Present this information graphically. Identify the key audiences and under each list the tools that can be used to address them. Under each tool, list the focus of the outreach effort for that audience. Use a unique identifier for the legally required outreach.*

IMPLEMENT THE OUTREACH

Define the Schedule

This section of the outreach plan should present an outreach schedule. The overall target timeframe to commence operations of the geothermal power plant or direct use system should be incorporated into the schedule. The outreach efforts should begin prior to permitting, be integrated with the permitting efforts through the permitting phase, and should continue through project operation, which may include project monitoring efforts. The schedule should also identify the mandatory versus the optional outreach efforts.

Document Outreach

The plan should also identify the methods for documenting the outreach efforts. A spreadsheet or database can be created to track outreach efforts by group, as identified on the Master Contact List.

Prepare meeting notes for each meeting.

This information can be provided to the lead agency or CEQA/NEPA consultant to include in the documentation of scoping efforts.

MEASURE SUCCESSES AND EVALUATE EFFECTIVENESS OF THE EFFORTS

The outreach plan should identify the methods that will be used to evaluate outreach efforts to find the most effective approaches for future projects. Methods can include:

- *Ask for input from participants as to the clarity, usefulness, and effectiveness of outreach materials.*
    - *Conduct surveys (pre-, mid- and post-project)*
- *Track the number of people that attend a field day; number that then sign up for the practice*
- *Track media coverage*
- *Track social media participation compared with other traditional methods*
- *Consider including a lessons learned meeting with agencies, other interested parties*

CHAPTER 5:
Conclusions

Public outreach is an important part of developing geothermal resources and is a necessary part of every project. Geothermal power will ultimately serve the members of the communities around it and creating a project in collaboration with the community and regulators will facilitate the permitting process. Concerns surrounding geothermal development are often misconceptions, and therefore, outreach efforts should seek to educate the audience. Part of outreach is also listening and making a good faith effort to address the concerns that are raised.

The long-term benefits of public outreach include building consensus and support around a project, allowing for a faster and less expensive permitting process, and creating a community and environmentally friendly project.

This Guide is intended to provide an overview of techniques and approaches for outreach. Not all aspects will apply to every project. Define your program to meet the needs of the community and the project goals.

Successful outreach can lead to a smoother permitting process. The California Geothermal Energy Collaborative is also publishing a Guide to Geothermal Permitting (*Expanding California's Confirmed Geothermal Resources Base: Geothermal Permitting Guide* by Blaydes & Associates, 2011) that should be available in early 2012. The Guide to Geothermal Permitting addresses the required permitting by process by development activity and the budget and time considerations that should be considered for the process in order to meet crucial scheduling and financial goals.

GLOSSARY

ACOE	Army Corps of Engineers
BLM	Bureau of Land Management
BTU	British thermal unit
CAA	Clean Air Act
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CGEC	California Geothermal Energy Collaborative
CO_2	Carbon dioxide
CURE	California Unions for Reliable Energy
CWA	Clean Water Act
DOE	Department of Energy
DOGGR	Department of Oil, Gas, and Geothermal Resources
EA/FONSI	Environmental Assessment/Finding of No Significant Impact
EGS	Enhanced Geothermal System
EIR	Environmental Impact Guide
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FTP	File transfer protocol
GEA	Geothermal Energy Association
IDNR	Iowa Department of Natural Resources
IS/MND	Initial Study/Mitigated Negative Declaration
KGRA	Known Geothermal Resource Area
MW	Megawatt
NEPA	National Environmental Policy Act
NEIC	National Earthquake Information Center
NGC	National Geothermal Collaborative
NGO	Non-government Organization

NHPA	National Historic Preservation Act
NOA	Notice of Availability
NOI	Notice of Intent
PIER	Public Interest Energy Research
ppm	parts per million
RD&D	Research, development, and demonstration
ROD	Record of Decision
SLC	State Lands Commission
USBR	United States Bureau of Reclamation
USDOD	United States Department of Defense
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

REFERENCES

Bloomfield, K., J.N. Moore, and R.M. Neilson Jr. 2003. Geothermal Energy Reduces Greenhouse Gases. Geothermal Research Council. GRC Bulletin, April 2003.

California Energy Commission (CEC). 2011. Background About Geothermal Energy in California. Website: http://www.energy.ca.gov/geothermal/background.html. Accessed February 3, 2011.

Darlene Cypser bibliography on induced seismicity: http://www.darlenecypser.com/induceq/induceq.html.

Dellinger, Mark and Eliot Allen. 1997. The Geysers Pipeline Project. GHC Bulletin. January 1997.

Drapeau, Mark. 2009. Government 2.0. How Social Media Could Transform Gov PR. Website (January 5, 2009): http://www.pbs.org/mediashift/2009/01/government-20-how-social-media-could-transform-gov-pr005.html. Accessed: February 10, 2011.

EPA (US Environmental Protection Agency). 1996. AP 42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combustion Sources, Table 3.4-1. Website: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf Accessed: February 2, 2011

Geoenergy.org. 2010. Website: http://www.geo-energy.org/plants.aspx, accessed 2/1/11.

GeothermEx, 1977, Evaluation of Kelly Hot Springs Prospect. Memorandum Guide prepared for Thermal power Co. and Geothermal Power Corporation. March 14, 1977.

Graham, William. 2008. The Effectiveness of Consensus Building in Renewable Energy Project Development: A Thesis in the Field of Environmental Management for the Degree of Master of Liberal Arts in Extension Studies. March 2008.

Institute for Participatory Management and Planning. 1990. Citizen Participation Handbook for Public Officials and other Professionals Serving the Public. Sixth Edition.

Iowa Department of Natural Resources. Public Outreach for Watershed Projects: Information and Education Guidebook. Third Edition. September 20009. http://www.iowadnr.gov/water/watershed/coord.html#support

Kagel, Alyssa, Diana Bates, and Karl Gawell. 2007. A Guide to Geothermal Energy and the Environment. Geothermal Energy Association. Updated April 2007.

Klingberg, Kevan. 2005. Livestock Facility Emissions and Odor Monitoring. Prepared for 2005 Wisconsin Fertilizer, Aglime and Pest Management Conference. January 2005

Majer, E. Baria, R., Stark, M. 2008. Protocol for Induced Seismicity Associated with Enhanced Geothermal Systems. US DOE.

McLarty, Lynn; Reed, Marshall J. (October 1992), "The U.S. Geothermal Industry: Three Decades of Growth", *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*

(London: Taylor & Francis) **14** (4): 443–455, doi:10.1080/00908319208908739, ISSN 1556-7230

MHA (MHA Environmental Consulting, Inc. [now RMT, Inc.]). 2005. Geothermal Outreach Principles and Comment Analysis Guide. Final Guide. Prepared for the National Geothermal Collaborative. January 2005.

Susskind, L.&Cruikshank, J., (2006). Breaking Roberts Rules – The New Way to Run Your Meeting, Build Consensus, and Get Results. New York, NY: Oxford Press. P 19.

Blaydes and Associates. 2007. *Expanding California's Confirmed Geothermal Resources Base: Geothermal Permitting Guide*. California Energy Commission. http://cgec.ucdavis.edu

California Environmental Quality Act (CEQA) http://ceres.ca.gov

California Permitting Handbook, 2002, California Technology, Trade & Commerce Agency, Office of Permit Assistance: www.permithandbook.com

Environmental Terms Glossary: www.dtsc.ca.gov/InformationResources/glossary

Geothermal Energy Association (GEA) Guides: http://www.geo-energy.org/Guides.aspx

Kagel, Alyssa; Bates, Diana; Gawell, Karl, 2005 A Guide to Geothermal Energy and the Environment Geothermal Energy Association, www.geo-energy.org

National Environmental Protection Act (NEPA) http://ceq.eh.doe.gov/neap/nepanet.htm

Slade, Lynn H. 1996 "Puzzling Powers: Overlapping Jurisdictions of Indian Tribes, the Federal,

State and Local Governments in Development of Natural Resources in Indian Country" www.modrall.com

State Water Resources Control Board, www.swrcb.ca.gov

Stoel Rives LLP, Lava Law:Legal Issues in Geothermal Energy Development, Second Edition, 2005.

U.S. Energy Information Administration Energy Abbreviations: www.eia.doe.gov/neic/a-zabbrev.

Additional information on geothermal resources can be obtained from the resources listed below.

California Energy Commission
Geothermal Program
1516 Ninth Street, MS-43
Sacramento, CA 95814
Phone: 916-653-7551
Email: renewable@energy.state.ca.us
www.energy.ca.gov

Energy Efficiency and Renewable Energy
Geothermal Technologies Program
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, DC 20585
Phone: 202-586-6054
www.eere.energy.gov

California Geothermal Energy Collaborative
Energy Institute at UC Davis
2028 Academic Surge
One Shields Avenue
Davis, CA 95616
Phone: 530-752-0152
www.cgec.ucdavis.edu

Geothermal Education Office
Marilyn Nemzer, Executive Director
664 Hilary Drive
Tiburon, CA 94920
Phone: 415-435-4574
E-mail: geo@marin.org

Geothermal Resources Council
P.O. Box 1350
Davis, CA 95617
Phone: 530-758-2360
www.geothermal.org

Geothermal Energy Association
209 Pennsylvania Avenue SE
Washington, DC 20003
Phone: (202) 454-5261
Fax: (202) 454-5265
www.geo-energy.org

Oregon Institute of Technology
Geo-Heat Center
3201 Campus Drive
Klamath Falls, OR 97601
Phone: 541-885-1750

Email: geoheat@oit.edu
www.geoheat.oit.edu

Appendix A:
How-To-Guides for Outreach Tools

1: INTRODUCTION

This appendix includes guidance for preparation for public outreach meetings, workshops, and tours, and tips and guidance for the preparation of printed materials. The guidance is taken from the Iowa Department of Natural Resources (IDNR) Watershed Program Public Outreach Plan Guide prepared by Jessie Brown, and has been adapted for geothermal projects and presented here with permission from IDNR.

2.1 Public Speaking

There is no such thing as a captive audience. Presentations, public speaking and speeches need to capture the minds of the audience. The audience should be "grabbed" in the first three minutes of a talk or it is lost. This can be done with an interesting statement or idea. After a rapport is established the next task is to maintain it.

Here are eight steps that can be helpful when making a presentation:

1. **Purpose** - definite objectives should be determined before following the other steps.
2. **Planning** - implies the thought processes necessary to organize points into a logical presentation.
3. **Organizing** - write an outline of important topics and sub-topics.
4. **Developing** - add details as necessary and obtain any important visual aids such as compiling supporting statistics, contracts, journals, statements, PowerPoint presentations or photos.
5. **Practicing** - the quickest way to become good at speaking is to do it often and strive for improvement. There is no such thing as a captive audience; if you are ill-prepared, the audience will know.
6. **Presenting** - a good speaker tells something, explains what was said, then summarizes what he or she talked about. Be clear and use language your audience understands. At the end of the presentation, attention should be focused on the main points with a summary. The summary should be short and forceful. Also, remember to end on time and stay on schedule.
7. **Evaluation** - for future reference, determine whether there were successes or failures during the presentation.
8. **Record and Store** - filing of materials and ideas for future efforts will save time in the long run.

Public speaking has the potential of making an impact if done properly. Many courses are offered in public speaking. See your local college, university or community college for course descriptions. Also interested individuals can participate in. Toastmasters International, an organization dedicated solely to practice public speaking. Contact your Chamber of Commerce for more information.

2.2 Public Meetings

Meetings should be held in facilities that are clean and neat with comfortable chairs, good ventilation, adequate lighting, good acoustics, and ample room. An uncomfortable person will not be able to concentrate on what is being said, and that can detract from the overall effectiveness of the meeting. Plan stretch breaks and coffee breaks to allow for informal discussion and offer the audience and presenters a chance to relax.

Advance publicity of a coming meeting is essential. Success depends on attendance, so reach as many people in your intended audience as possible. This can be done in many ways, including use of posters and brochures. A news release should be issued at least one month before the meeting and then again one week before the event and newspaper deadlines.

Remember to follow up with publicity after the meeting. Photographs or speakers add human interest. Results and highlights of presentations are publicized for those who could not attend. This late publicity also sets the stage for the next effort.

1. Be clear about the goals for the meeting. Announce how long the meeting will last and what subjects will be discussed. Identify three or four main ideas you want to convey and make sure the details support those points. Finally, make sure to address people's concerns rather than just giving the facts. If the meeting's goals or ideas are not clear, the meeting probably should not be held.
2. Listen to people when they express their values and feelings. Acknowledge people's feelings about an issue. Try restating what people have said so that they know you have heard them: "I can tell that you are concerned about this project because..." When people are speaking emotionally, respond to their emotions. Acknowledge the feelings and respond to the concerns in addition to providing information.
3. Recognize and be honest about the values incorporated in your project's decisions and be aware of your own values and feelings about the project. Recognize that your own feelings may cause you to resist modifications of a project or to react strongly to a community group. Don't mislead the community.
4. When you speak at a public meeting, tell people who you are, what your background is, and why you are there. Give people a sense of why you are qualified to discuss a topic and what you can and can't do for them.
5. Let people see you are human. People will treat you as a person if you act like one. If you act like a bureaucrat, you will be treated accordingly.
6. If speaking makes you uncomfortable, work on it until it gets easier. Prepare as thoroughly as you can. Practice your presentations. Role-playing can also help.
7. The project representative should be consistent throughout the life of the water quality project, if possible. Trust takes time to build.
8. Know your audience and gear your presentation to its level. When explaining technical information, it can help to imagine that you are talking to an intelligent but uninformed friend and speak at that level.
9. Be sure to give people sufficient background. Don't assume that condensing information is the same as making it clearer. Beware of the tendency to oversimplify and give only data that support your point. People know when you are using ammunition for your argument as opposed to presenting information.
10. Use down-to-earth language as much as possible. Watch jargon and acronyms.
11. Choose supporting graphics or visual aids that illustrate your message clearly and simply. Be cautious about using graphics intended for technical audiences. Hastily or ill-conceived graphics can be worse than none. Even well-executed graphics will not go over well if they do not deal with people's concerns.

12. Be aware of body language and other signals your audience gives you that they're lost. Slow down, back up, or ask questions.
13. Have background material available at meetings.
14. Always have question-and-answer periods after your presentations.
15. Critique your presentation afterward, so you can learn from the things that went right as well as those that did not.

2.3 Workshops

Workshops are one of the most valuable techniques to teach landowners and other interested persons in the community. Training gives them a sense of ownership in the project and an important feeling of participation.

1. Each workshop or training session should have only one theme. It is better to concentrate on one subject than to try to cover multiple themes. The chosen topic can involve research, installation of conservation practices, any phase of management, or other problems that are addressed by water quality projects.
2. Notify individuals well in advance of the meetings so as not to conflict with other agency schedules. Recruit outside specialists from other agencies for guest leaders. It gives your workshop credibility.
3. Workshops should last a few hours. Provide frequent breaks.
4. Try to schedule a wide variety of presentation types. For example, follow a standard presentation with an interactive session. Lectures should be mixed with laboratory work, field tours and demonstrations.
5. Give ample time for questions and answers following each presentation. Discussion should be stimulated as much as possible. It gives participants a chance to take part and keep the program from dragging.
6. Some type of evaluation or survey should be given at the close of the session. It increases concentration and attention during the workshop and can give you a record of the knowledge participants received while attending. This evaluation can help with future sessions.

2.4 Field Tours

Demonstrations and field tours must be adequately and carefully planned. Arrangements should be made for transportation, rest stops, lunch, hot drinks on cold days and cold drinks on hot days. People should be briefed before the trip starts. A written itinerary aids in reviewing background and concentrating attention where desired. Every stop must be coordinated with distances, time and roads known. Enough time should be allowed to do the job, but events must not be allowed to drag. Minor things, such as rough roads or too much dust, can put accent on the hardship rather than on the tour or the idea being presented.

One common problem with any outdoor tour is people often cannot see what is going on or hear what is being said. Small groups and a loudspeaker will help. A group discussion at the end of the tour serves to bring all parts together with a common agreement and understanding.

Additional questions can be asked and answers given while events still are fresh in the participants' minds.

2.5 Open Houses and Special Events

A special event or open house is usually a promotional venture to increase public awareness of an existing geothermal project. It is a staged event for delivering news about the project. The public often attends to witness the event rather than the entire effort of the project. These events are useful for informing groups such as governmental officials and the community. If conducted correctly, they will prove to the community that the project proponent is a thoughtful neighbor and good citizen of the community. It should also draw attention from the media.

The project proponent can plan an event to attract an audience and to get publicity for the project, particularly after completion of a project milestone or for a project anniversary. There might be contests, scavenger hunts, free coffee and doughnuts, and prizes for the winners. While people are at the event, there should be free materials available showing the efforts by the project proponent and community in the project.

Advantages can be numerous if the special event or open house is done properly. Here's a few suggestions for your event.

1. Plan in advance. Little things are important, such as availability of parking space, toilets, refreshments, a photographer. You should start at least two months in advance.
2. Publicity is necessary before and after. News releases and announcements should be sent out six to eight weeks before the event, invitations at least three weeks before. Hard-sell publicity, such as posters and articles should be used one to two weeks before. Think as well about scheduling on-the-spot publicity and follow-up articles after the event.
3. Develop a schedule for the event. Print it as a handout or program and distribute one week before the event. This can also be used during the event.
4. Use guides, employees, or the project advisory committee to explain things, give tours or answer questions. A special guide should be available to the media for interviews and questions.
5. If you decide not to use guides, have a small presentation to explain the reasoning behind the event, the accomplishments or goals of the project.
6. It's a good idea to give a small souvenir and serve refreshments.

3.1 Printed Materials

When planning a publication you must consider the purpose, audience, message and outline of the material to be included. Then you must write the material, decide on a basic style for the manuscript, draft it, rewrite it, then edit and polish it. Finally, you must decide how it will be produced. Determine the format and design, set the manuscript into type, prepare the layout and then print it. Printing can be a large budget item, but it is also an area where you can save money.

1. Shop around. Obtain bids from several vendors.
2. Check with printers on specifications to avoid confusion on printing requirements.
3. Paper is sold by the pound. Consider switching to a lighter sheet, which cuts your paper and postage costs. Ask for bargains in discontinued paper and closed-out stock. Few readers can distinguish between grades of paper.
4. Desktop publishing is the most common way of getting materials ready for printing. Desktop publishing programs can be purchased and used on your own computer, or contract with someone to do it for you.
5. Print posters on both sides for double visibility in store windows.
6. Print on recycled paper (30 percent post-consumer content) and feature a specific logo and statement regarding recycled paper.

Avoid expensive extras in printing through good layout and design. Embossing, color separation, die cuts, odd sizes, unusual folds, gold or silver stamping, special scoring or binding can be avoided with simple layout and design techniques.

The major function of layout and design isn't to win an art contest, but to gain and hold the reader's attention. A good heading or drawing is interesting to look at and moves the reader's eye down into your printed message. Here are some tips for effective design:

1. Use readable typefaces, with serif types, stay away from sans-serifs. Avoid fonts that are difficult to read (such as scripts) or are too casual and less professional (i.e. Comic Sans MS).
2. Consider larger type for sight-impaired audiences.
3. Avoid using light text over a dark background (called "reverse type") in body copy (your main text section).
4. Investigate potentials for a self-mailer publication with address and label surfaces planned in layout and design of the publication.
5. Remember that photographs provide credibility. Try to remove the date stamp if possible.

3.2 Graphic Design

Good graphic design draws people in to a display, gains attention for flyers and posters, and invites people to read a newsletter. Layouts can make a piece more interesting and easier to read.

Poor graphic design can turn someone away and keep them from receiving your message. The following are standard design tips to consider when creating a communications product:

1. Consider contacting your local college or university to see if there's an opportunity for students to design your materials or create a template as part of a class project.
2. For newsletters, break up text into two or three columns. Use short paragraphs - generally one to three sentences long.
3. Use fonts that are easily readable. Serif fonts (which have "hooks" on the end of letters, like this font) are generally best for main paragraph text. Sans-serif fonts (like Arial, and Verdana that are straight, block letters) work well for headlines. Avoid casual fonts, such as Comic Sans MS. They are generally difficult to read and look less professional. Posters, however, can sometimes make good use of a mixture of casual and professional fonts.
4. Standard font size is 12 pt; avoid smaller than this, especially if your audience is older. Headlines are generally 18-30 pt. Font size can make your stories easier to read.
5. Boldface and italic type should be used to bring attention to important points, but use it sparingly. Using boldface or italics too frequently loses the effect of emphasizing important points and makes a story hard to read. Think of the fable of the "boy who called wolf."
6. Photos, graphics and bulleted lists are great ways to break up text in a newsletter or flyer. Breaking up text makes a piece seem more manageable to the reader and will help keep their attention. However, strike a good balance between these visuals and text blocks. Too many graphics or photos can make the page look crowded and uncoordinated. Choose photos over clip art as much as you can, as photos add credibility.
7. Choose colors that fit your theme, like green or earth tones. Bright colors, like neon shades, can draw attention but can also be hard on the eyes.

3.3 Writing and Correspondence

Because your goal is to be understood, consider these ideas about easy-to-read writing for letters and correspondence:

1. Be conversational. Write like you talk. If you catch yourself writing a vague or complex phrase ask yourself, "how would I say that?" This is also handy if you get "stuck" or have "writer's block."
2. Use short, familiar words. Question every word of three syllables or more that you are tempted to use. Avoid using jargon and extra words that aren't needed. Simpler is better. When a technical word must be used, explain it as simply as possible.

Modification	Change
Utilization	Use
Initial	First
Optimum	Best
Encounter	Meet
Demonstrate	Show
Objective	Goal
BMPs	Conservation practices
ACRONYMS	If you need to use acronyms or initials, spell them out on first use.

When in doubt, take an extra sentence to explain something more clearly using general terms. This is especially useful when defining conservation practices. A good resource for these definitions is Conservation Choices or the Conservation Catalog produced by NRCS.

3. Use personal words. Words like “you,” “we,” a person’s name, direct quote, give your letter a more human characteristic.
4. Use short sentences. This is the best technique and the easiest. Sentences averaging between 15 to 20 words are considered easy reading. Any long sentences can be broken up.
5. Create short paragraphs. Keep paragraphs short, and vary their length from one to five average sentences.
6. Don’t ask readers to unscramble your ideas. Place thoughts in logical order. State your major point in one sentence. Tell why it’s important, then list other appropriate information.
7. Use a letterhead with a project logo. Make your correspondence and press releases quickly recognizable by using a standard letterhead with your project's name and logo. (See examples of letters on the following pages)

3.4 Brochures and Factsheets

Brochures and fact sheets are an attractive addition to any successful project. They can help clarify the project issues and give people a starting point for asking questions. Brochures are most useful when given out in a face-to-face meeting, such as leaving a project brochure with a landowner after a meeting at his or her home. Fact sheets and brochures work well as additional information for public meetings. Before creating a brochure, think carefully about how it will be used and if it is the most effective medium for sending your message to an audience.

1. Brochure design should be on an 8.5" x 11" sheet of paper. The paper can be folded once or twice to produce four to six panels. Legal size paper (8.5" x 14") can also be used and folded into three places to create eight panels.
2. Brochure copy must be brief and to-the-point. Only the most important information should be included. Remember the key is to keep the reader’s attention. If extra space is

available, do not use filler information; instead use a graphic or blank space to make it more visually appealing.

3. A fact sheet is usually an 8.5" x 11" piece of paper, printed on one or both sides, but not folded. A fact sheet delivers basic facts and ideas in a clear-cut way, and can include graphics and photos.
4. Brochures are printed in the same manner as newsletters. Fact sheets can also be printed professionally or with a copier.

3.5 Project Newsletters

Every newsletter is different. In general, they maintain your relationship and project awareness with your audience and provide a call to action for your audience. Newsletters can tell of recent developments with the geothermal project, Guide research and other findings of interest to the readers, answer frequently asked questions, carry success stories of the project, promote upcoming events, and relay useful practices and ideas.

1. When doing an article for your newsletter, start with a brief, to-the-point paragraph. Vary the length of your opening sentences, but generally speaking, keep sentences and paragraphs short for easy reading and more attractive appearance. Keep it simple. Avoid long introductions. Use familiar words. Speak the language of your readers.
2. Have an easy-to-remember title and heading design and include your logo. Use the title and color scheme for your newsletter every issue to increase recognition with your readers.
3. Add color by printing your newsletter on colored paper if you are printing in black and white. The difference in cost between this and white paper is very little. When using colored paper, keep in mind whether or not you'll be photocopying the newsletter. Some papers do not photo copy well.
4. If you print or duplicate on both sides, use a paper with enough weight so that there will be no "show through."
5. You can save time and money by designing the newsletter with a self-mailer address panel on the back cover. It cuts out the need to "stuff " envelopes and can limit the cost of envelopes and postage weight. Contact a printer or post office for size regulations.
6. Use a two- or three-column format for easy reading.
7. You can break the monotony of the column by occasionally indenting statements, quotes or other material you'd like to have stand out.
8. Make good use of white space by not cramming too much on one page. If it is a "tight"" one page issue, make it a two page issue with white space instead.
9. Create a one-year production schedule to help you plan ahead for story ideas rather than scrambling at the last minute. Write your own "canned stories" when the idea strikes and keep them on hand for when you need to fill space in a newsletter.
10. Your extra effort in writing, editing and rewriting your copy will mean less effort for your readers. Make clarity the main goal of your editing and your readers will stick with you through many newsletters.

11. Remember you can lend credibility to your newsletter by inserting visual aids such as photos.
12. Make sure your newsletter is dependable, reaching the right people at the right time.

The following is an outline for newsletter format and things to avoid when producing your project newsletter.

1. Print in four-page, 8 1/2" x 11", two- or three-column format.
2. Publish on a regular schedule, but only as often as necessary. If you don't have enough information to fill a newsletter every two months, do quarterly newsletters, for example.
3. Feature policy announcements, company announcements, community events, and general information on geothermal development.
4. Edit by project staff. Always have more than one person proofread. Have a friend with a non-science background proofread to see if you have explained technical terms clearly.

Things to avoid:

1. Crowded or cluttered appearance.
2. Poor writing style, inaccuracy and typos.
3. Small or hard-to-read type. (What are your audiences' sight capabilities? 12 pt. is a normal size for readable type.) Use an easily readable font, like Times New Roman. Do not use more than two to four fonts. Keep bold and italics to a minimum.
4. Conflicting colors and poor reproduction (some recycled or colored paper does not copy well).
5. Bad graphics. (If a photo is too dark, busy or pixelated, don't use it.)
6. Cumbersome folds.
7. Undependable production schedule.
8. Using "filler" stories that do not directly deal with the project.
9. Using stories from other sources. Original content seems more credible. If you use stories or images from other sources, make sure it directly applies to your project and always get copyright permission to reprint the story or image. This includes articles and images accessed online as well as from the local newspaper.

The secret to dependability is to set deadlines by working backward from the delivery date to the starting point:

1. Delivery date — October 1
2. Mailing date — September 26
3. Printing date — September 16
4. Printer's proof — September 13
5. Final draft complete — September 10
6. Art and copy corrections — September 6
7. Proofreading — August 28
8. Layout — August 26
9. Copy editing — August 20
10. Stories due to editor — August 15

11.	Assignments	July 15
12.	Planning meeting	July 15
13.	Last issue delivered	July 1

Appendix B:
Example Scoping Meeting Presentation

Appendix C:
Approach to Technical Issues and Outreach

Introduction

This Appendix identifies environmental issues that are often raised by agency staff or the public during the outreach process and demonstrates how they can be addressed during public outreach.

Approach to Outreach on Key Issues

Air Emissions

Issues

Air quality impacts from geothermal development include emissions from drilling and construction activities. However, geothermal power plant operation air emissions are generally limited because geothermal power plants do not burn fuel like fossil fuel plants; they release virtually no air emissions (Kagel et al. 2007). The visible plumes seen rising from some geothermal power plants are actually water vapor emissions (steam), not smoke. Some impacts can occur, and many are typical of any construction or drilling project. Typical air quality-related concerns include impacts of emissions from dust and diesel combustion during construction and operations-related emissions during testing, production, and venting of geothermal systems. Geothermal fluids can have constituents of concern in very small quantities that rarely rise to levels of alarm including hydrogen sulfide (H_2S), boron, bicarbonate, mercury, arsenic, and particulates.

Approach to Address Issues

Identification and Quantification of Emissions. Air quality impacts should be addressed by describing the types of emissions expected from the project construction and operation and providing quantification of the emissions (expected or representative concentrations can be used prior to engineering and resource testing).

Typical emissions from any type of construction equipment and machinery include:

Carbon monoxide (CO)

Carbon dioxide (CO_2)

Total organic compounds (as methane) (CH_4)

Oxides of nitrogen (NO_x)

Particulate matter less than 10 microns (PM_{10})

Oxides of sulfur (SO_x)

Drilling emissions for geothermal wells typically includes the following additional potential pollutants in limited amounts from geothermal fluid or steam:

Boron (B)

Mercury (Hg)

Arsenic (As)

Ammonia (NH_3)

Bicarbonate (HCO_3)

Particulate Matter (PM_{10})

Carbon dioxide (CO_2)

Operations emissions depend on the type of geothermal system implemented. Binary power plants are closed loop systems and have little to no air emissions during the operational phase, unless geothermal fluid is used for cooling. Emissions from flash plants are similar to those identified for drilling.

An estimate of air emissions should be made for geothermal projects. During outreach efforts with the agencies and the public, the estimates should be summarized and provided in the discussion of air effects. Some air modeling for binary/flash and flash plants can provide a summary of plume drift. It may also be important to note that constituents such as boron, mercury, and arsenic are often naturally occurring in high concentrations in the soil in geothermal areas and therefore impacts from steam drift can often be considered negligible in comparison to the concentration of the constituents already in the soils.

H_2S emissions are sometimes identified as a concern during geothermal development; however, hydrogen sulfide is now routinely abated at geothermal power plants, resulting in the conversion of over 99.9 percent of the hydrogen sulfide from geothermal non-condensable gases into elemental sulfur, which can then be used as a non-hazardous soil amendment and fertilizer feedstock (Kagel et al. 2007).

H_2S can be released from a well during drilling and is emitted with the steam and other non-condensable gases during flow-testing. H_2S is a colorless, non-condensable gas, with a characteristic "rotten egg" odor. The OSHA indoor workplace standard for H_2S is 10 ppm for an 8-hour day (Klingberg 2005). H_2S can cause negative human and animal health effects; however, nuisance odor is of primary public concern since the distinctive odor can be easily detected at concentrations far below levels of health concern. Odor is detectable from about 0.008 ppm.

H_2S is typically encountered during the production zone drilling phase but can be mitigated through the installation of a chemical abatement system, maintaining well heads, and preparing contingency plans for hydrogen sulfide releases. Certain geothermal areas have higher

concentrations of H_2S than others. Outreach in areas where the geothermal development may be near communities should clearly identify the ways in which the H_2S emissions will be monitored and minimized.

Carbon dioxide emissions are often a greenhouse gas emission concern raised by the public for any project. Geothermal drilling can release carbon dioxide, which is naturally occurring in steam fields such as The Geysers. Carbon dioxide emissions should also be quantified; however, as part of the outreach effort, the benefits of geothermal energy over coal or gas should be presented and explained. The table below shows the comparative emissions by fuel type.

Geothermal vs. Fossil Fuel CO_2 Emissions for Electrical Generation

	Geothermal	Coal	Petroleum	Natural Gas
Emissions (pounds CO_2 per kilowatt hour)	0.20	2.095	1.969	1.321

SOURCE: Bloomfield et al. 2003

Developing a Monitoring Program. An air monitoring program should be defined and established if any of the project emissions may exceed regulatory thresholds or include certain high concern pollutants such as H_2S. The reasons why the monitoring program is needed, who will be implementing and reviewing the data from monitoring efforts, how the public can access that information and provide input on the monitoring effort, and what will be done to mitigate air impacts should be clearly articulated. Mitigation should be built into every project, including best management practices to minimize dust during construction, and use of appropriate equipment to minimize dust emissions while drilling (e.g., using water in the drilling system to reduce particulate matter emissions).

Water Resources

Issues

Water resource impacts associated with geothermal development include impacts to surface water and groundwater quality, as well as impacts to ground and surface water supplies, and to the geothermal resource itself.

Approach to Address Issues

Water Quality. Concerns over contamination of groundwater and surface water sometimes arise and are usually relatively easy to address. Groundwater is protected through the well casing and cementing, which prevents the co-mingling of geothermal fluid and groundwater. Surface spills of geothermal fluid are often cited as a concern if they seep into shallow groundwater; however, proper spill control measures and emergency plans will abate these

concerns. Providing the public with a hotline to ask questions will often help to further reduce concerns.

Groundwater Supply. It is important to quantify a project's groundwater use during the construction and operation of the project and to identify the source of that water. Geothermal projects most often use groundwater on an ongoing basis for two purposes: cooling systems and for injection to replenish a geothermal reservoir that has experienced productivity decline after many years of operation (due to loss of mass and pressure within the geothermal reservoir from evaporation of fluids in the cooling tower). Identification of the long-term water needs of a project should be integral in the initial design of a project. Early outreach efforts to both the public and the agencies should address water supply issues, which can also encompass water rights issues.

Consideration of alternative methods of cooling, such as dry cooling or hybrid cooling systems (if proven feasible in the future), where feasible, should be made. Dry cooling is often not feasible in hot desert climates because of the substantial loss in efficiency; therefore, if a project requires wet cooling, the justification should be presented to the public and agencies.

The use of the fluid for cooling can require supplemental injection in the future. Projects such as the Coso Geothermal Plants in Inyo County and The Geysers in Sonoma and Lake Counties have raised awareness around the long-term water needs of geothermal projects. Outreach efforts should acknowledge the possibility of future water needs for any project with consumptive use of the geothermal fluid. The project should be engineered from the earliest phases to minimize water loss, or to utilize creative solutions to address water needs. Treated wastewater is pumped from Santa Rosa to The Geysers and used for injection.

For projects that require groundwater pumping, nearby groundwater users should be identified and consulted for concerns. Modeling may become necessary to quantify the groundwater drawdown and effects to surrounding users. A robust mitigation monitoring plan should be developed.

Direct use systems (referred to here as the use of low temperature geothermal resources for thermal applications, such as space heating, aquaculture, greenhouses, food drying, etc.) can present their own set of water resource issues. Geothermal resources used for direct use systems are often not as deep as resources used for commercial-scale development and the geothermal systems can be mixed with the groundwater system. While direct use systems are commonly believed to have fewer impacts than large-scale power generation projects, planning these systems to include injection of the geothermal fluid back into the reservoir is important so that surface discharge and loss of groundwater is avoided. Developers of these types of low temperature systems should consider addressing impacts to groundwater users, impacts to other geothermal system operators, and impacts to nearby hot springs and wetlands. Modeling can also be used to predict the groundwater drawdown from the proposed project and a monitoring plan developed based on the modeling.

In systems that evaporate some of the geothermal fluid environmental concerns have been raised since aquifers can be depleted if the water is not re-injected. Improperly installed wells can permit surface water run-off carrying pesticides, fertilizers, organic materials and other contaminants into underlying aquifers. Properly installed and maintained systems pose relatively few problems. But because the potential for abuse exists, some states and communities have prohibited the use of open loop systems. Check local codes for water discharge regulations.

Water resource issues should be addressed early and thoroughly. Modeling may become necessary. One challenge with water supply analysis is that it can be very technical. It is really important that the information is presented to the public in an understandable format. When defining groundwater impacts the resources and uses that can be affected should be considered. Some drawdown may be acceptable, for example, if it would not result in the loss of size or diversity of a wetland. The thresholds of significance for impacts should also be articulated with the analysis and modeling results.

Cultural Resources

Issues

Impacts to cultural resources vary from physical impacts to archaeological sites to impacts to effects of noise and views on traditional cultural values and sacred sites. Projects with a federal component will require formal consultation with Native American tribes.

Approach to Address Issues

Pre-Historic and Historic Resources. Archaeological surveys performed over the project area will allow for flexibility in moving well pads, roads, and pipelines as the project progresses. Any potentially eligible archeological site identified during surveys should be avoided to the greatest extent feasible. Employing a tribal representative during construction is advised for areas with high archaeological sensitivity.

Tribal Concerns. Projects in areas with sacred sites or traditional cultural values that are impacted by geothermal development should include an ethnographic research component. The research may include interviews with tribal members to understand traditional and current use, traditional values, and concerns about the proposed development. Mitigation should be developed with local tribal representatives to give them a voice and to try and discover mutually beneficial solutions to the resource conflict. Through conversations with the local tribes, sites of particular interest may be avoided if the impacts to the sites are understood early in the process. Understanding what the spiritual impacts are can also be important for determining mitigation for a project, such as to make a power plant less visible or to provide access to sacred sites during special ceremonies. The balance between cultural values and economic and environmental benefits of the project should be discussed in order to work towards a mutually acceptable project.

A good indication that a project may have high interest to the local tribes is if hot springs are located nearby since these springs can be highly valued by the tribes. Providing data and ongoing monitoring to assure protection of the hot springs is important for these sites.

Visual Resources

Issues

Visual resource impacts are another area that can be difficult to assess and to develop consensus around, as visual impacts are often subjective. Impacts associated with geothermal development include the impacts of seeing the power plant and well field, an industrial facility in a rural setting; lighting in an otherwise unlit area; visibility of steam plumes; and visibility of new transmission lines.

Approach to Address Issues

Visual resources should be assessed in accordance with the guidance of the land managing agency such as the US Forest Service or the Bureau of Land Management, for projects on federal land. Visual quality objectives should be set and key observation points selected in consultation with the environmental review of the lead agency. Recreational areas should also be addressed. Developers should consider preparing visual simulations for public outreach meetings and brochures. Often, the simulations can alleviate concerns around industrialization of an otherwise rural area. The planning of the development should be sensitive to the surrounding land uses. Materials such as paint and landscaping can help conceal project components and should be noted during the characterization and presentation of the project to the public.

Steam plumes are often cited as a visual concern. It is important to describe how steam plumes form and under what conditions in order for the audience to understand the impact Steam plumes can be described in comparison to clouds, fog, or other atmospheric conditions and often are seen naturally in areas of hydrothermal activity. The plumes will change throughout the day and the seasons and therefore the plume may not be considered a permanent change in the visual appearance of the area. Sensitive cooling tower design, including drift eliminators, can reduce the size of steam plumes.

Transmission lines should be planned to minimize visual impacts, but their visibility will depend upon the geographic locations and their size and type. Transmission lines are hard to conceal in areas of open desert. Using existing corridors and minimizing the length of line needed to tie into an existing transmission line can help minimize effects. A visual resources specialist should be engaged to help design the transmission corridor to minimize visual effects. The types of poles or towers used, the finish of the poles, etc. can all act to dramatically reduce visual impacts.

Again, it is important when planning a project to understand where important visual, recreational, and cultural resources are located in order to avoid those areas to the greatest extent feasible while the design of the project is still flexible. Soliciting early input from the agencies and public to identify these sensitive areas can help facilitate the siting process.

Hazards

Issues

Induced Seismicity. Another frequently cited concern with geothermal development, particularly Enhanced Geothermal Systems (EGS) projects that inject water to generate fracturing of the geothermal reservoir, is induced seismicity. Traditional geothermal resources are inherently located in tectonically active areas prone to earthquakes. The public might express concern of an induced large-scale earthquake, as well as annoyance at increased frequency of micro-seismic events which are generally considered as earthquakes less than 3.0 in magnitude that do not cause property damage.

Well Blowouts. Well blowouts, whether they are oil wells or geothermal wells, can cause contamination of the air and water including release of dangerous levels of H_2S. A well blow out may require evacuation of a neighborhood for developments with nearby populations. Well blow-outs are rare and many measures can be taken to avoid them. .

Approach to Address Issues

EGS projects will raise considerably more concern over induced seismicity. The Department of Energy has issued the "Protocol for Induced Seismicity Associated with Enhanced Geothermal Systems," authored by E. Majer, R. Baria, and M. Stark (2008). The protocol is divided into the following steps and includes outreach components. All EGS projects should consider implementation of the protocol. Seismic experts should also be included on the team to address the predicted induced seismicity. Developing a robust monitoring network, sharing data from seismic monitoring, and providing contingency plans are all critical elements for successful outreach on EGS projects. The protocol includes:

Review laws and regulations

Assess natural seismic hazard potential

Assess induced seismicity potential

Establish a dialogue with regional authorities

Educate stakeholders

Establish microseismic monitoring network

Interact with stakeholders

Implement procedure for evaluating damage

Establishing a geothermal impact mitigation fund committee and funds for nearby communities should be considered to develop a better relationship with neighbors that may be impacted by EGS projects.

Well Blowouts and Pipeline Failures. The design of pipelines and mechanisms for well or pipeline shut off in the event of a leak should be demonstrated to show that the project can be operated safely and that the developer is committed to community and environmental protection.

Biological Resources

Issues

Biological resource concerns often center on:

The loss of vegetation for development of project components such as transmission lines, well pads, pipelines and the power plant; impacts to wetlands

Impacts to listed species

Impacts to wildlife including exposure to noise, sump contents, transmission lines

Impacts to migration

Impacts to habitat from increased off-road vehicle use from project roads

Approach to Address Issues

It is important to understand the biological resources in a project area prior to project design. Wetlands should be avoided to the greatest extent feasible as permitting can be time consuming and costly and the public and agencies may express particular concern over impacts to wetlands. Consideration should also be made for thermal marshes, which often occur near hot springs. Decreases in temperatures and pressures in the geothermal resource could alter the size and/or nature of these marshes and the wildlife (especially birds) that utilize them. A hydrologic analysis and monitoring program can be used to address impacts to marshes to provide scientific evidence of impacts to be presented during outreach efforts.

Loss of vegetation can be mitigated through salvage of topsoil during construction and reseeding with native seed mix.

Impacts to wildlife from exposure to drilling mud and cuttings or geothermal fluids in fluid disposal pits or basins is sometimes cited as a concern by the public or agencies. Avian deterrents/exclusion devises such as nets or floating balls can be used. These devises prevent avian species from being exposed to geothermal fluids. The nets prevent landing on the disposal pit or basin, and the balls generally deter them. Similar deterrents can also be used on new transmission lines to minimize risk of collision, particularly of raptors with the lines.

Listed species that can occur in a project area should be identified. Consider potential indirect impacts to wildlife from projects. For example, a direct use project in Canby, CA included discharge of filtered geothermal fluid into the Pit River. The fluid had trace amounts of mercury, which could have indirect impacts on bald eagles through bioaccumulation of mercury from foraging on fish from within the river. The issue was addressed through a site

specific evaluation of bioaccumulation that demonstrated minimal impacts (see Real Example on the Canby Direct Use Project Mercury Bioaccumulation Monitoring Program).

Consultation with the USFWS should occur during the environmental review phase to address particular species of concern. Creative solutions and mitigation can usually be established during the consultation process. Revegetation is often used to mitigate loss of vegetation habitat. Pipelines can be placed above the ground surface with clearance beneath for small animals to pass. Migration corridors should be considered during the siting of the project pipelines to minimize effects.

Geothermal development usually requires the building of additional roads to access well pads, pipeline, and transmission, hat can lead to greater access for off-road vehicles into undisturbed areas. This concern is often cited by the land management agency as well as the public. It can be difficult to prevent off-road vehicles from utilizing the new road systems, but signing the roads against off-road travel and periodic paroling of the roads should be offered to minimize additional environmental degradation.

Most biological impacts could occur during construction. Having a biological representative as an on-site monitor that Guides to the agencies can alleviate concerns and help minimize the potential for a project to have a negative impact on biology.

Noise Pollution

Issues

Noise pollution from geothermal plants is typically considered during three phases: the well-drilling and testing phase, the construction phase, and the plant operation phase. During the construction phase, noise may be generated from construction of the well pads, transmission towers, and power plant, and drilling of the geothermal wells. During the operation phase, the majority of noise is generated from the cooling tower, the transformer, and the turbine-generator building (Kagel et al. 2007). Noise can be an issue of particular concern to nearby residents as well as recreationalists and should be addressed during the outreach efforts.

Approach to Address Issues

The generation of noise should be addressed by phase. Typically, the construction and drilling phase will be the noisiest. Noise pollution associated with the construction phase of geothermal development is a temporary impact that ends when construction ends. The duration of construction should be presented to the public. Well pad construction can take anywhere from a few weeks or months to a few years, depending upon the depth of the well. In addition, construction noise pollution is generally only an issue during the daytime hours and is not a concern at night, except for well drilling, which typically occurs 24 hours per day and can last from 45 to 90 days per well (Kagel et al. 2007). Most of the time residents are not located in close enough proximity to a plant to experience noise impacts. The impact should be addressed by mapping the nearest sensitive receptors (e.g., residents, hospitals, schools, recreational areas),

and estimating the noise generation that would be experienced at each. Several noise muffling techniques and equipment are available for geothermal facilities. During drilling, temporary noise shields can be constructed around portions of drilling rigs. Noise controls can also be used on standard construction equipment, impact tools can be shielded, and exhaust muffling equipment can be installed where appropriate. These noise control methods are effective at lowering noise levels to acceptable levels so as not to cause disturbances to nearby residents.

Operational noise can come from turbine generators. Because turbine-generator buildings are usually designed to accommodate cold temperatures except in the desert, they are typically well-insulated acoustically and thermally, and equipped with noise absorptive interior walls (Kagel et al. 2007).